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Division of Fisheries & Wildlife

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The Board Reports

George Darey
Chairman

The Massachusetts Fisheries and Wildlife Board is a group of seven persons, each selected for a demonstrated interest in wildlife. By law, the persons appointed to the Board are volunteers, receiving no remuneration for their service to the Commonwealth. Five of the seven are selected on a regional basis, with one member, by statute, representing agricultural interests. The two remaining seats are held by a professional wildlife biologist or manager, and a representative with a specific interest in the management and restoration of those wildlife populations not classified as "game species." Each member is appointed by the Governor to a five year term. The Board oversees operations of the Division of Fisheries and Wildlife, reviews programs and sets policy and regulations pertinent to wildlife in the Commonwealth.

During this fiscal year the Board continued to hold monthly meetings at locations around the state, hold public hearings on proposed regulatory changes, and address issues of specific concern.

While many different matters and issues were brought before the Board this year, most of its time was spent in scrutiny and review of Division programs and proposals for regulatory changes. Among the items examined were:

Deer Management: The Board considered and approved the number of antlerless deer permits to be issued for the 1994 hunting season. In addition, it received public comment at a public hearing held in July relative to increasing the length of the shotgun deer season in certain deer management zones. Following review of the public comments, the Board voted unanimously to accept the staff recommendation to increase the length of the deer season from 9 to 12 days only in zones 1-11. Further, the Board instituted the change to take effect for the 1993 season, rather than the 1994 season as originally proposed.

Two public hearings were held concerning regulations pertaining to primitive firearms in regard to allowing in-line ignition systems during the primitive firearms deer season. After much consideration and many thoughtful comments from its members at the meeting in May, the Board voted 5 in favor and 2 against to allow the in-line systems. At the same meeting, the Board voted unanimously to allow the use of mechanical releases during bowhunting.

Wildlife Management Areas: A public hearing was held in August to solicit comments on proposed changes in WMA regulations. The proposed changes were of a routine nature, merely updating regulations to incorporate the names of new WMAs or those which have changed status so that Environmental Police Officers can effectively enforce regulations which vary according to whether or not each area is stocked with pheasant and/or quail. The motion was passed unanimously at the September meeting.

Endangered & Threatened Species Regulations: The Board held a public hearing in August regarding proposed additions and deletions of species on the Massachusetts list of endangered, threatened and special concern species. Following staff presentations and a public hearing held in August, the Board voted unanimously at the September meeting to approve the staff's recommended changes, including six regulation changes, five name changes and one addition to the list.

Upland Game Bird Regulations: Following a presentation by Dr. Deblinger and consideration of the public comments received, the Board voted unanimously to enact conservation measures the staff recommended due to agricultural and habitat loss. The new regulations will create a common opening day (the Saturday after Columbus Day) for pheasant, grouse and quail. This opening day will also include those portions of the cottontail, snowshoe hare and grey squirrel seasons which had formerly opened on October 20, but will not apply to the western zone squirrel season or the Dukes and Nantucket rabbit/hare seasons. There will be no hunting of grouse after November 20, and the daily bag for bobwhite quail was reduced from 5 to 4.

Waterfowl Management: The Board set waterfowl seasons and bag limits within the federal framework following a presentation and recommendations by Waterfowl Project Leader H Heusmann and a public hearing held in August.

Personnel Actions: As overseer of the operations of the Division of Fisheries and Wildlife, the Board votes confirmation of hirings, promotions, retirements and other personnel actions within the Division. During the year the Board presided over three new hires and one resignation.

License Display: Following the Board's vote last fiscal year that the Division would enter into a Memorandum of Understanding with the Division of Law Enforcement to waive the display requirement for the calendar year, the Board voted unanimously at its January meeting to endorse an extension of the non-display license requirement for the calendar year 1994. This display waiver could become permanent if a bill currently in the legislature is passed.

Nature Preserves: The Board heard a report from Dr. Tom French relative to the proposed Nature Preserves Regulations, and held a public hearing in January to solicit comments on these proposed regulations. The Nature Preserves statute was passed in 1989 and will be administered by the Division of Fisheries and Wildlife. A seven member Nature Preserves Committee, including four members of the Nongame Advisory Committee, has been appointed by the Secretary of EOEA and will advise the Division on the management, selection, policies and regulations relating to Nature Preserves. The Board notes that Nature Preserves are intended to serve as representatives of the state's native natural communities and ecosystems, and also serve to provide scientific research and educational opportunities. Hunting, fishing, trapping and other uses that are non-destructive to the habitat will be allowed unless inappropriate for other reasons. The Board voted unanimously to approve the proposed regulations.

Striped Bass Emergency Regulation: During the June meeting, the Director proposed that the Board provide him with approval to execute emergency regulations pertaining to striped bass. The Division of Marine Fisheries had requested that he issue an emergency regulation requiring that striped bass caught in freshwater meet the same minimum length requirements as those taken in saltwater. The Board voted unanimously to allow the Director to exercise his powers to execute the regulations.

Salmon Regulations/Definition of a Hook: The Board heard fisheries staff recommendations to define "a hook" ; to reduce the minimum length for brood salmon from 18 to 15 inches; to close the lower Merrimack River below Essex Dam to brood salmon fishing; and to close the Merrimack River upstream of the Essex Dam to Atlantic salmon fishing. All of these proposals were presented at a public hearing in May, and in June the Board voted unanimously to accept them.

Turkey Permit Changes/Trapping Birds by Farmers: Two minor changes were proposed in the wording of migratory bird regulations; first to permit farmers to trap (rather than only shoot) pigeons, starlings and English sparrows in compliance with Federal regulations; and second, to change wording in the wild turkey regulations so that they read to turn in the "turkey tag" but give back the permit itself. These were minor housekeeping items, but a public hearing was held in February regarding these proposed regulation changes. Following review, the Board voted unanimously to accept the proposed changes.

Other Activities: In the course of reviewing Division projects and programs, the Board heard and addressed numerous other issues. These included hearing a staff report on a petition to designate Cape Cod Bay as significant habitat for the Northern Right Whale, but no action was taken as the designation would not provide any additional protection for the species at this time. The Board will continue to monitor the situation.

The Board also heard an excellent presentation from John Scanlon on his research and recommendations for early successional habitats in Massachusetts, and looks forward to considering proposals to enhance the amount of this habitat in the state in the future. The Board also heard presentations by Division staff on housekeeping items relating to the regulations governing Commercial Shooting Preserves and the issuance of various permits by the Director; held a public hearing on them in March; and voted unanimously to accept them in April. On another housekeeping matter, the Board also voted unanimously to approve staff recommendations to implement the existing license classes into regulations.

The Board also heard a presentation by fisheries staff regarding aquaculture regulations. A public hearing on this matter was held in June, and the Board looks forward to implementing clear, concise regulations and a standard process for issuing aquaculture permits early in the next fiscal year.

The Board also heard a presentation from Tom Decker on proposals to improve regulations governing Problem Animal Control. A public hearing will be held on these proposals in July.

Massachusetts Fisheries & Wildlife Board

George L. Darey, Lenox, *Chairman*

Nancy Begin, Topsfield, *Vice Chairman*

John F. Creedon, Brockton, *Secretary*

Gwilym S. Jones, Framingham

Michael P. Roche, Orange

Ernest W. Foster, Jr. , Worcester

Russell A. Cookingham, Monument Beach

Fisheries

Dr. Mark S. Tisa
Assistant Director, Fisheries

Fishing, hunting and wildlife related recreation are important recreational activities for residents and non-residents of Massachusetts. According to the 1991 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, freshwater anglers in the Commonwealth spend over $100 million each year to pursue their sport. In addition, that generates some $8 million in state sales and income taxes while supporting nearly 3,000 full time jobs.

The Commonwealth's aquatic resource inventory includes a variety of pond, lake, stream and river habitats supporting everything from coldwater, wild trout fisheries to warmwater panfish species. There are approximately 2,675 lakes and ponds, totaling about 142,681 surface acres. Ponded waters are mostly less than 500 acres in size. The two largest bodies of water, both man-made drinking water supplies, are the Quabbin (25,000 acres) and Wachusett (5,000 acres) Reservoirs. Angler access is partially restricted on both reservoirs. The largest river in Massachusetts is the Connecticut River with 72 miles (7,284 acres) transecting the Commonwealth. The 2,027 named streams flow about 10, 704 miles and comprise approximately 14,900 acres. The protection, management and enhancement of these inland fisheries resources and their associated habitats involves several ongoing fisheries projects.

Anadromous Fish Investigations

Hydropower

Westfield River: A settlement calling for the construction of up and downriver fish passage facilities with fish trapping capability for returning Atlantic salmon, was reached with Decorative Specialties International Inc. (DSI) of West Springfield. Director MacCallum signed the Memorandum of Agreement along with the Regional Director of the U.S. Fish and Wildlife Service and President of DSI on February 2, 1994. The agreement also insures that water flow will always occur in the 2,000 foot long bypass reach of the river to protect resident fish and other aquatic life.

Downriver smolt passage facilities were constructed at the Littleville Power Project in Russell. These facilities were required by the Federal Energy Regulatory Commission (FERC) once Massachusetts Division of Fish and Wildlife developed the plan to restore Atlantic salmon to the Westfield River.

Chicopee River: Northeast Utilities Service Company (NUSCO) sought to obtain license exemptions for their four hydroelectric projects on the Chicopee River. A condition of the granting of the exempted status from the FERC was that minimum flow turbines would be installed. Economic conditions have resulted in NUSCO requesting a delay in the installation of these turbines. Until the time that minimum flow turbines become economical, minimum flow will be provided through other means. In FY94 minimum flow was provided into the bypass reaches at the Dwight Street and Indian Orchard Projects. Equipment necessary to provide minimum flow at the Putts Bridge and Red Bridge Projects is likely to be installed in FY95.

Deerfield River: Significant progress was made in the relicensing of the five hydropower facilities on the Deerfield River in Massachusetts. The information gathering phase is complete. MDFW will make recommendations to the Massachusetts Department of Environmental Protection (MDEP) for minimum flow requirements and fish passage needs for inclusion to the MDEP Water Quality Certificate. The projects are currently operating under an annual FERC license. It is anticipated that the MDEP Water Quality Certificate and the FERC license will be issued in FY95.

Other Rivers: Preliminary stages of relicensing of the Hadley Falls Project on the Connecticut River began in FY94. Primary issues of concern are the endangered shortnose sturgeon, anadromous fish passage, minimum flow in the bypass reach, up and downriver effects of peaking hydroelectric production.

Section staff reviewed a proposed run-of-the-river hydroelectric project on the Sawmill River. Primary issues concern the inundation of the riverbed through headpond creation, anadromous fish passage and minimum flow in the bypass reach.

Anadromous Fish

The most significant development in the anadromous fish arena this year was the petition by a public group called Restore The North Woods to list the Atlantic salmon as endangered. The U. S. Fish and Wildlife Service found that the petition had merit and will determine if the species should be listed.

Connecticut River: The number of American shad and blueback herring lifted at Holyoke Dam was off dramatically from the numbers lifted over in the past few years. This decline was seen in other east coast rivers as well. Biologists have focused their attention on the increase in near-shore commercial fisheries which have become established along the mid-Atlantic states as one possible explanation for the decline in spawning populations. Atlantic salmon numbers, however, were up over 1993. A total of 256 salmon were counted at Holyoke.

Twenty five were released to travel up river. Of these, eight were known to have passed through Turners Falls, Massachusetts, and Vernon, Vermont. Atlantic salmon were also captured for use as brood stock from the Westfield River in West Springfield. Low flows in the river made capture more difficult. However, seven were taken from the river and transported to the federal hatchery where they will be spawned this fall (Nov. 1994). This year marked the last year hatchery smolts will be released. All future hatchery production will be limited to fry. Increased fry releases into the entire Connecticut River basin totalled about 4.5 million this year and will increase to a targeted 9-10 million over the next few years. In Massachusetts, 1.4 million fry were stocked into the Westfield, Deerfield, Manhan, Sawmill, Mill and Fall River basins. Downstream smolt passage facilities were completed at the Littleville Power Project on the Westfield River. A Memorandum of Agreement was signed by the Director along with the Regional Director of the U.S.Fish and Wildlife Service and the owners of West Springfield dam which provides for the construction of a fish ladder and downstream fish passage facility by 1996. A similar agreement is being considered for fish passage facilities on the Deerfield River and could be signed later this year.

Northeast Utilities Service Company has agreed to provide a seasonal release of 120 cfs into the two mile long bypass reach of Connecticut River in Turners Falls to allow returning fish access to the river below the powerhouse and to protect them from becoming stranded in the area below the dam.

Merrimack River: A second year of low numbers of American shad was seen at the Lawrence Fish lift this year. However, river herring numbers rebounded to about 90,000. The decrease in American shad numbers was seen in other rivers as well giving credence to the theory that poor marine survival was the cause for the reduced population. The number of returning Atlantic salmon was the poorest in the history of the restoration. Only 17 adult Atlantic salmon were counted at the Lawrence facility. Almost all the returning fish were from fry stocked origin. At this point in time the reasons for the poor returns are unknown. Returns were expected to be higher than average due to the closure of most of the commercial high seas fisheries for Atlantic salmon during the previous year.

Two state fisheries regulations concerning Atlantic salmon in the Merrimack River were changed this year. First, the regulation allowing fishing for Atlantic salmon in the Merrimack River upriver from Lawrence was changed to close that portion of river to Atlantic salmon fishing, because all salmon are trapped at Lawrence for brood stock purposes. The second regulatory change was to make it illegal to possess any Atlantic salmon caught below Lawrence Dam. Broodstock salmon stocked in the Merrimack River in New Hampshire drop downriver to this location when sea-run Atlantic salmon are migrating upriver. Anglers fishing for brood stock salmon might have caught sea-run Atlantic salmon and taken them by mistake. The closure of this area to salmon fishing ensures the maximum protection for returning sea-run Atlantic salmon.

During the year a section of the wall along the canal failed causing a shutdown of the fish passage facilities at the Lowell powerhouse for most of the season. To deal with this problem, shad and herring were passed upriver using the fish ladder at the Pawtucket dam. An estimated 34,000 herring and 400 American shad were passed through this facility. Summer help will begin to survey the Shawsheen and Concord Rivers to determine the extent of shad and river herring habitat within those two rivers.

Fish Kill Investigations

The Massachusetts Division of Fisheries and Wildlife serves as the lead agency relative to fish kill investigations. The Division maintains a 24-hour fish kill response capability from April 1st to September 30th and a weekday response during the remainder of the year. The objectives of MDFW's fish kill response plan are to: (1) ensure immediate investigation of fish kills to minimize damage to fishery resources; (2) to obtain timely and accurate information relative to sources and cause for appropriate legal and remedial action and (3) to maintain a statewide data base capable of detecting waters with repeated kills or conditions toxic to fish so that mitigative actions can be taken.

In FY94, there were 55 fish kills (49 ponds, 6 streams); 26 of which required a field investigation. The number of fish killed for the period was 28,900. This compares to 37 reported fish kills and 4,430 dead fish in FY93. The increase in fish kills was probably the result of near record low flow conditions during the summer of 1993 in eastern Massachusetts followed by a severe winter with prolonged ice cover. Records indicated that 14 of the 55 fish kills occurred at locations with a history of repeated natural fish kills. Most kills were attributable to stranding during low water conditions, deoxygenation under heavy ice cover or stress/disease related kills between ice out and the first hot spell of June.

There were only two minor pollution-related kills. A kill of 120 brook trout and 12 blacknose dace occurred at Freeland Brook in Blandford on 07/23/93 associated with the outlet valve of the Springfield Water Supply's pipe to Cobble Mountain Reservoir and a kill of six trout and white suckers on the Otter River in Gardner, MA, on 07/30/93. The Freeland Brook kill involved operations of a water supply which is exempted under Chapter 131 Section 42.

The Otter River fish kill involved turtles, invertebrates and amphibians as well as fish but was reported too late to find a source or exact cause.

Quabbin and Wachusett Reservoirs

The fisheries staff, reviewed 37 years of fisheries and water quality data on Quabbin and concluded that significant changes had occurred since the early 1980's including: a reduction in the reservoir's productivity, loss of stream spawning access, more stable water levels, a significant expansion of lake trout and white perch populations, a decline in the smelt forage base combined with an explosion in *Asellus.* To assess management implications, the fisheries staff initiated a baseline survey of prey-predator relationships including recruitment, fish stock densities, age, growth, mortality rates, and seasonal food habits. These population parameters, which had been historically unavailable through the previous creel census, will be used to model the bioenergetics of the reservoir and to better understand the predator-prey dynamics in Quabbin.

Intensive netting and tagging of spawning salmon found an estimated 1,500 adult salmon (three to five years old). Some 60,000 smolts had been stocked between 1989 and 1991 and anglers caught less than 3,000 legal fish (18 in). This suggests a low survival rate, less than 50 % per year. Age and growth data support this finding. The average salmon grew well initially, increasing from a stocking size of about 8.5 inches at fourteen months of age, to 18 inches during the middle of the third year of life. This growth was achieved on a diet of insects in May and June, supplemented by rainbow smelt in July, when the reservoir stratified. While the salmon consumed rainbow smelt for the rest of the year, these fish were found in only 33 % of the stomachs, implying a low density of this forage fish. Even with rapid second and third year growth, few landlocked salmon appear to survive beyond age three. There are at least four possibilities that may explain the low survival of older landlocked salmon: 1) genetic limitations, 2) disease, 3) lack of an abundant fish forage base or 4) hooking mortality. These aspects will be examined further in coming years.

Salmon stocking levels were cut from the three year average of 20,000 to 10,000 this year for two reasons: 1) to allow their principal forage species to maximize reproduction, and 2) to adjust stocking levels to reflect wild salmon production. Last summer significant salmon reproduction occurred in five of the larger streams This reproduction could contribute an additional 1,000 smolts to the reservoir this year. In addition, 7,800 fry were released into the East Branch of the Swift River in May to evaluate growth potential in Quabbin's largest tributary. If successful, this stocking could produce 2,000 smolts in 1996.

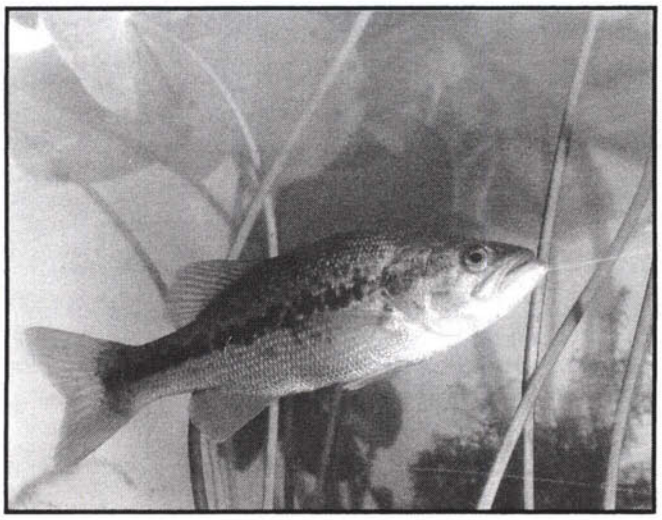
Lake trout numbers increased from a few hundred fish in the creel in 1957 to between 4000 and 6,000 fish in recent years. No shallow spawning fish were taken in fall netting operations. Apparently, the deeper spawning strain of lakers which was introduced in the late 1970s is supporting the population. Smaller lake trout (18-22 in.) appear to be much more numerous in gillnets as well as in the creel and growth rates are slower than historically recorded. Stomach samples provide a partial answer to this slower growth, indicating that the forage situation at Quabbin has changed dramatically since the last comprehensive study. In the 1970's, rainbow smelt were found in approximately 50 - 70 % of the lake trout samples versus 36 % in 1993. While twenty years ago rainbow smelt were the principal forage throughout the year, our samples show that the principal forage changes seasonally, with rainbow smelt dominating in April and early May and again in the fall. During the rest of the growing season, an isopod, *Asellus spp.*, sustains the fishery. This organism was seldom noted in the diet prior to 1980. Although growth rates have slowed in comparison to past years, the reservoir still produces fish in the ten pound range and each year at least one fish has been landed in the fifteen to sixteen pound class. In fact while sampling last August, a lake trout larger than 25 lbs. was taken in a net and released unharmed.

Rainbow smelt, the principal food of salmonids at Quabbin, appears to be declining in abundance. The two indices used to measure relative abundance, namely spawning surveys and catch-per-unit-effort via gill nets, both indicated decreased abundance. In 1994, smelt were found spawning in only two streams as compared to to five in 1993. The estimate of egg deposition declined from 129 million in 1993 to 34 million in April 1994. No shoreline egg deposition was noted last spring, while several shoals were noted to have been used the previous year. Summer gill netting produced only 76 smelt in comparison to catches of 500 to 1000 during the early 1970's, when lake trout grew much faster. Many of the traditional smelt spawning streams were found to have been blocked by beaver dams.

Sampling at Wachusett reservoir has been less intensive than at Quabbin due to limited manpower and restrictive use regulations.

An experimental stocking of landlocked salmon in 1982 has produced a self-sustaining fishery which uses the Stillwater River as spawning and nursery habitat. Lake trout, which had entered the reservoir in the 1960's via the aqueduct from Quabbin, have established large self-sustaining populations. As at Quabbin, these fisheries are based on rainbow smelt as the primary forage species. As at Quabbin, the stream spawning was limited to two tributaries last spring. Unlike Quabbin however, significant

shore spawning (3.6 miles) was documented this year. Unlike stream spawning smelt which deposit their eggs over moss and vegetation in moderate currents, these fish sought gravelly, moderately windswept areas, generally less than two feet deep. Total egg production was estimated at 283 million eggs. This production is adequate to support the salmonids in 4,100 acre Wachusett reservoir.



Warmwater Fisheries Investigations

1994 saw the continuation of work under two major studies initiated in 1992: the Statewide Bass Survey and Research project and the Statewide Esocid Survey and Research project. These studies involved work carried out by the Division's Warmwater Project Leader and Assistant Leader with extensive input from the state's five Wildlife Management Districts and the Massachusetts Cooperative Fish and Wildlife Research Unit.

The Statewide Bass Survey and Research study consists of a four part approach; a statewide bass population survey, a statewide bass creel survey, bass population computer modeling and an assessment of alternative bass management regulations. Currently, the statewide population survey and creel survey are ongoing.

Twelve lakes across the state were sampled in the spring by night electrofishing to determine such bass population parameters as relative abundance, growth rates, age and size structure, recruitment, relative weights, mortality rates and exploitation. These twelve lakes, along with nine lakes sampled during the spring of 1993 and ten lakes from 1992 are contributing to an ongoing statewide database which will ultimately be used to determine the current status of bass populations under our existing regulations and fishing pressure. Analysis will continue as the database is expanded. In an effort to standardize sampling techniques, upgrading of the District's electrofishing boats continues. Currently, two of the five boats have been upgraded with a third underway. Additionally, a smaller version of our electrofishing boat is being refurbished to allow sampling of waters not conducive to the larger units. This will allow the Division to sample a larger number of waterbodies over a shorter period of time.

Roving winter creel surveys were conducted on 17 lakes across the state to gather information on pressure, catch rates and harvest rates for all species. Four of these surveys were conducted through the assistance of college interns. This information will help us in determining how many they are catching and how many they are keeping. As with the statewide survey, these creel surveys will be ongoing.

1994 also saw the initiation of step three in the four part approach to bass management. The Massachusetts Cooperative Fish and Wildlife Research Unit began a search of all computer population models which predict how a population will respond to the manipulation of regulations (creel, length season etc.). Based on criteria which we provided, user friendliness, input parameters etc., four promising models were chosen. These models will be tested with one ultimately selected to generate alternative regulations for waters designated for analysis.

The management plan for the Commonwealth's two hatchery reared esocids, northern pike and tiger muskellunge, consists of a three part approach; a statewide northern pike and tiger muskellunge population survey, a statewide northern pike and tiger muskellunge creel survey and development of a consistent esocid stocking protocol. This plan was initiated during the fall of 1992.

Gillnetting was conducted on three lakes during the fall to gather data and tag northern pike. Tagging aids in determining catch rates as well as providing information on how fast the fish are growing. Similarly, two lakes were sampled in early spring immediately following ice-out. Early spring sampling has proven successful due to the fact that pike are very mobile in shallow water at this time of the year. The Division recently acquired a series of fyke nets which should prove to be effective in capturing larger number of esocids than are presently being checked. They will be deployed in select waters this fall. Fish captured during the spring will be used to oversee the feasibility of raising our own northern pike.

The state of Virginia provided the Division with approximately 7,500 surplus northern pike and New Jersey supplied an additional 10,000 surplus pike. This allowed the Division to nearly double its output of pike in the fall. The tiger muskie program, which has relied on fish provided to the Division by Pennsylvania as feeding fry and subsequently cultured at the Palmer facility, also underwent changes. The Pennsylvania Fish Commission held the allotment

of tiger muskies until early fall allowing for the release of a much larger fish thereby increasing chances for survival which should ultimately lead to more fish entering the fishery.

Hatcheries

1994 was an extremely successful year for the Division's hatchery and stocked trout program. During the spring stocking season, a total of 805,970 brook, brown and rainbow trout were stocked. During the fall, a total of 23,807 12+ rainbow trout, 7,000 12+ brown trout, and 41,741 six to nine inch brook trout were stocked. Table 1 is a summary of the number of each species of trout produced at each of the Division's four trout hatcheries for the spring and fall stocking seasons. Total trout production for the 1993 - 1994 fall and spring stocking seasons was 462,460 pounds, which met the Division's goal to produce at least 450,000 pounds annually (Table 2).

The Geezer Brigade (left to right): Richard Currier, Al Aittainemi, Eugene Morrow, William Marganella, Craig Lodowsky, Phil DuPuis, Richard P. Johnson. (Absent: Donald Moberg and Robert K. Ball).

The outstanding level of trout production that was achieved in 1994 was accomplished despite a record-setting cold winter and with the Sandwich Hatchery still off-line while it undergoes renovation. The McLaughlin, Bitzer and Sunderland Hatcheries all deserve recognition for their outstanding efforts to provide the Commonwealth's sportsman with a superior trout program and to compensate for the production that normally would have occurred at Sandwich Hatchery.

By all accounts, 1994 was one of the best trout fishing seasons on record in the Commonwealth. This was due in part to the size and abundance of the more than 875,000 trout produced by the Division's hatcheries and stocked in more than 500 waters statewide.

The quality of trout fishing also was enhanced as a result of a reduction in the trout creel limits that took effect at the beginning of the year. The creel limit changes were implemented due to the fact that the Division's hatcheries can routinely produce much larger trout than those stocked in the 1950's when the last creel limit changes were made. Under the new regulation, the creel limits were changed from 6 to 3 trout per day in the ponds and major rivers, and from 12 to 8 trout per day in other rivers and brooks during the spring/summer fishing seasons. The fall/winter season limits were set at three fish per day across all waters. Based on reports received since the new creel limits took effect, it seems clear that the new regulation is providing better fishing for Baystate anglers. Many anglers have indicated that 1994 was the best year for trout fishing in memory.

As previously noted, the Sandwich Hatchery has been closed for renovations since November 1992. Following a period of extensive planning by Division staff, a contract was awarded in the fall of 1993 to a general contractor to commence with the renovations. Work on the renovations began almost immediately and despite setbacks brought on by record setting snow and cold during the winter, the majority of the work was completed by June. All that remains to be completed before the hatchery goes back online is final testing and procedural checks. Renovations to the hatchery included installation of a new electrical system, alarm system, back-up power generating system, a completely new water piping system, and two new wells to complement the two existing wells. In addition, the hatchery's extensive concrete raceway system was also refurbished by a local group of volunteers who call themselves the "geezer brigade". The quality and craftsmanship demonstrated by these remarkable individuals is outstanding. The efforts of the "geezers" were recognized in October when they were given a Certificate of Commendation signed by Governor Weld. It was presented to them by Director MacCallum and Commissioner Phillips during a special gathering held in their honor.

The Roger Reed Hatchery in Palmer continued to provide a valuable service to produce fish stocks for three of the Division's programs in 1994. These are the Atlantic salmon restoration program, the landlocked salmon program for Quabbin Reservoir and the northern pike program. A summary of the numbers of each of the three fish species produced by the Roger Reed Hatchery is in Table 3.

1994 Fish Production

Table 1. Summary of 1994 fish production by numbers at each of the Division's four trout hatcheries.

Species	Size Cat. (inches)	Hatchery				Total Number
		Bitzer	McLaughlin	Sunderland	Sandwich	
Rainbow	6 - 9	0	0	0	0	0
Trout	9+	35450	30100	47890	0	113440
	12+	17150	253527	18782	0	289459
	Sub-total	52600	283627	66672	0	402899
Brook	6 - 9	0	41741	0	0	41741
Trout	9+	19000	144517	38350	0	201867
	12+	0	45215	0	0	45215
	Sub-total	19000	231473	38350	0	288823
Brown	6 - 9	21400	0	0	0	21400
Trout	9+	56650	0	54225	0	110875
	12+	28020	0	26501	0	54521
	Sub-total	106070	0	80726	0	186796
Total		177670	515100	185748	0	878518

Table 2. Summary of 1994 trout production by weight at each of the Division's four trout hatcheries.

Species	Size Cat. (inches)	Hatchery				Total Wgt. (lbs)
		Bitzer	McLaughlin	Sunderland	Sandwich	
Rainbow	6 - 9	0	0	0	0	0
Trout	9+	17164	9303	25050	0	51517
	12+	24311	157398	15648	0	197357
	Sub-total	41475	166701	40698	0	248874
Brook	6 - 9	0	5780	0	0	5780
Trout	9+	9183	51604	18746	0	79533
	12+	0	33011	0	0	33011
	Sub-total	9183	90395	18746	0	118324
Brown	6 - 9	5266	0	0	0	5266
Trout	9+	16061	0	19048	0	35109
	12+	27345	0	27542	0	54887
	Sub-total	48672	0	46590	0	95262
Total		99330	257096	106034	0	462460

Table 3. Summary of 1994 northern pike, landlocked salmon, and Atlantic salmon production at the Roger Reed Hatchery.

Species	Size Cat. (inches)	Number	Weight (lbs)
Northern Pike	8+	5200	755
Tiger Muskies	8+	5000	610
	Total	10200	1365
Landlocked salmon	fry (1-2)	7370	22
	parr (4+)	11000	485
	smolts (7+)	13200	2030
	Total	31570	2537
Atlantic salmon	unfed fry (1+)	761500	280
	feeding fry (2+)	21500	32
	adults (15+)	602	3340
	Total	783602	3652

Fisheries Staff

Mark S. Tisa, *Assistant Director, Fisheries*
Joseph Bergin, Aquatic Biologist III
William Easte, Aquatic Biologist II
Richard Hartley, Aquatic Biologist III
Colleen Hubbard, Clerk
Richard Keller, Aquatic Biologist III
James Lagacy, Fisheries Technician
John O'Leary, Aquatic Biologist III
Todd Richards, Aquatic Biologist II
Ken Simmons, Aquatic Biologist III

Hatcheries Staff

David Fredenburgh, *Chief Fish Culturist*

Sandwich Hatchery
Alan Aittaniemi, Manager,
Craig Lodowsky, Fish Culturist

McLaughlin Hatchery
Jim Hahn, Manager,
Kurt Palmateer, Fish Culturist
John Sousa, Fish Culturist

Roger Reed Hatchery
Mike Masley, Manager
Arthur Pellegri, Fish Culturist

Sunderland Hatchery
Frank Pietryka, Manager
John Besse, Fish Culturist

Montague Hatchery
John Williams, Manager
Holly Hubert, Fish Culturist

Wildlife

Dr. Robert D. Deblinger
Assistant Director

The Wildlife Section oversees research and management of all avian and mammalian species which are utilized in any way for sporting purposes. This includes oversight of the Ayer Game Farm where Ring-necked Pheasants are propagated. The Section has a staff of nine biologists and technicians who conduct projects throughout the state assisted by District personnel and working in close cooperation with the U.S. Fish and Wildlife Service and with the Massachusetts Cooperative Wildlife Research Unit.

Migratory Bird Census

Mourning Dove Census: The number of calling doves on three long-term survey routes decreased 10% from 1993 to 1994. Counts on eight comparable routes increased 9% from 1993 to 1994.

Woodcock Census: A woodcock census was conducted on 15 singing-ground routes between April 24 and May 10, 1994. Survey results showed a 25.3% increase in the Massachusetts woodcock breeding population index over 1993, and a 17.6% decrease was noted in the Eastern United States Management Region.

Woodcock

Waterfowl Research and Surveys: During June and July 1993, the Division participated in the third year of a 3-year effort to collar resident Canada geese as part of an Atlantic Flyway Canada goose study being headed up by Dr. Jay Hestbeck of the University of Massachusetts' Cooperative Wildlife Research Unit. Cutbacks in federal funding for this project reduced the number of collars available to the participating states. Hestbeck was able to provide only 210 collars. The Division purchased an additional 210 collars from state funds. There were also about 50 collars left over from previous years.

A total of 1,862 Canada geese were banded of which 286 goslings and 182 adults were collared at 93 sites across the state. An additional 126 previously collared birds were recaptured during roundups. During the 3-year collaring phase of this project, the Division has banded a total of 7,555 geese of which 2,461 were collared on a total of 288 sites from Nantucket to the New York border, and from Parker River to Penikese Island.

Part of the resident Canada goose study involves making observations of collared birds. This allows the Division to determine population size, trace movements, and determine recovery and survival rates. A simple mark:resight ratio estimate suggests that Massachusetts had a pre-migratory population of 36,000 Canada geese in 1993. During the observation phase of this project we observed 1,065 unique collar codes, of which 907 were from Massachusetts marked geese. The remaining collars were on birds that had been marked from Prince Edward Island to North Carolina.

In August the Division began preseason banding efforts for ducks. Low water conditions hampered airboat nightlighting. Several traditional sites were inaccessible because water levels were too low to launch the airboat. Between August 11 and September 27, we made 17 trips with the airboat and banded 610 wood ducks, 92 mallards, 3 black ducks, 11 green winged teal, 8 blue winged teal, 1 hooded merganser, 11 soras, 7 Virginia rails, and 4 common moorhens. In addition, volunteer Chris Michaud bait-trapped and banded 58 mallards and 14 black ducks in southeastern Massachusetts.

During September 7-15, Massachusetts conducted its fourth resident Canada goose season in the Berkshire waterfowl zone. This year an expanded framework of September 1-15 allowed a longer season.Previously, the season could not run beyond the 10th. As Massachusetts hunting seasons do not open until after Labor Day in order to minimize conflicts with other forms of outdoor recre-

ation, this closing date had severely restricted the season. A total of 436 permits were requested, but only 255 permit holders actually hunted during the September season. They harvested a total of 308 geese.

The annual midwinter coastal waterfowl inventory was flown on January 3 and 6, 1994. A total of 342,150 waterfowl were counted. Black duck numbers were up 22% from 1993 and 26% above the 10 year average. Counts for goldeneyes, buffleheads and mergansers were substantially below average, while scaup were 7% above the 10 year average and mallards were down 2%. The biggest surprise was scoter counts at a record high 144,540. Eider numbers were also high with 131,995 birds seen. Most of these sea ducks were observed in a megaflock in Cape Cod Bay, an unusual spot for such numbers. Brant were 5% below the 10 year mean while Canada geese were down 14%. Mute swan counts were a record high 1,150.

Between January 21 and February 5, 1994, Massachusetts held a late, resident Canada goose season in its coastal and central waterfowl zones. Permits were requested by 1,925 sportsmen. The harvest for the late season was estimated at 2,939 geese, with 42% higher than last year. While the central zone harvest was similar to last year, the coastal zone harvest doubled, reversing a 5-year trend of declining harvests. Record snowfall blanketed much of the state, concentrating geese on open areas, reducing hunting opportunity and forcing other geese to the coast where they were available to hunters.

Massachusetts, along with 10 other northeastern and mid-Atlantic states, conducted a survey for breeding waterfowl utilizing 1 kilometer square plots from mid-April to mid-May 1994. This is the second year of an operational survey previously modified to better sample salt marsh habitat and improve the precision of wood duck population estimates. A total of 1,453 plots were checked, including 95 in Massachusetts. Population estimates for the surveyed areas were: mallard pairs - 423,509± 16%; black duck pairs - 28,135 ± 29%; wood duck pairs - 153,380 ± 20%; Canada goose pairs - 175,477 ± 21%; total Canada geese - 578,176 ± 25%.

Wood duck research began in May when the first of 3 early morning call counts were made on 7 routes located across the state. Timing of the routes was changed this year to correspond with the annual Breeding Bird Survey conducted by the U.S. Fish and Wildlife Service. Results were sent to the U.S. Fish and Wildlife Service for analysis. Division personnel also conducted multiple nest box checks on 20 areas for the same flyway wood duck study. The 20 areas were some of the 53 sites used by the Division to monitor wood duck populations statewide. Summer checks of the 53 study sites revealed 479 wood duck nest starts in 692 available boxes, with 359 successful hatches (75%). In addition, there were 39 hooded merganser hatches from 46 starts. Production in 1994 was similar to last year.

Pheasant Program

A total of 47,440 ringnecked pheasants were released statewide during Fiscal Year 1994. Twenty-two thousand three hundred thirty eight (22,338) were reared at the Ayer State Game Farm. Eighteen thousand (18,000) were purchased from contract vendors.

These birds were released as follows:

40,388 released during the fall by DFW staff. 7,102 eight week old birds were distributed to sportsmen's clubs participating in the pheasant rearing and release program.

48 were retained for shows and exhibits.

Pheasants released for hunting were distributed as follows (figures include birds released by clubs and other organizations):

Southeast District	8,186
Northeast District	5,188
Central District	16,784
Conn. Valley District	12,750
Western District	4,532

Wild Turkey

Wild Turkey Range and Harvest Evaluation: The 15th Massachusetts spring gobbler hunt was held in May 1994, with the season divided into a one-week first segment and a two-week second segment. The open zone was increased to include the entire area of Worcester County, and the number of allowable permits correspondingly increased to 18,600. A total of 6690 permit applications were received for the 1st period and 5616 for the 2nd period. Despite a harsh winter, a harvest of 1006 turkeys was attained (the 3rd straight year over 1000), with an overall success rate of 8.2%. The Berkshire county harvest was 387 (38.5%), followed by Worcester (235), Franklin (188), Hampshire (111), and Hampden (85) Counties. Adult males comprised 519 (51.6%) of the take.

The fourth modern-day fall either-sex turkey season was held from November 8-13, 1993. Hunting was allowed in all counties and portions of counties west of the Connecticut River. There were 13,044 eligible permittees. A total of 177 turkeys was taken, including 94 (53%) in Berkshire County, 56 (32%) in Franklin County, 14 (8%) in Hampshire County, and 12 (7%) in Hampden County. One additional bird came from a questionable locality.

Winter trapping was good, due to extensive snow cover. A total of 34 turkeys were captured and transplanted during January - March. Eight (1M, 7F)

Black bear sow and two one-month-old cubs in winter den, a thick patch of laurel.

were released on the Facing Rock W.M.A. in Ludlow, Hampden County; and 26 (11M, 15F) near the Peterson Swamp W.M.A., Plympton, Plymouth County.

Black Bear

Black Bear Distribution and Harvest Investigations: A total of 1778 bear hunting permits were issued for the 1993 hunting season. A near-record total of 59 bear were taken during the 2-week split season, including 54 during the 1st segment and five during the 2nd segment. Thirty-three males and 26 females were taken in Berkshire (19), Franklin (19), Hampden (3), and Hampshire (18) counties. Seven road kills, six depredation kills, two capture mortalities, one abandoned cub, and one animal found dead were also recorded. A total of 34 bear complaints were received, primarily including eight bears raiding bird feeders and five complaints of trash raiding.

Furbearer Management Program

The furbearer program is responsible for the management and research of twelve species of wildlife in the Commonwealth. This group includes weasel, skunk, fox, coyote, beaver, otter, fisher, raccoon, opossum, bobcat, muskrat and mink.

Massachusetts' furbearers are abundant and widely distributed throughout the state. The value of the Commonwealth's furbearer resource is very diverse and includes ecological, recreational, economic, educational and aesthetic opportunities to individuals in the state.

The furbearer program uses many standard wildlife management techniques including habitat manipulation and regulated hunting and trapping as management tools in the management of these renewable resource in the Commonwealth. The combination of these two techniques in particular are used to:

1. Control problem animals
2. Control wildlife populations
3. Reduce habitat degradation
4. Reduce crop and property damage

In addition these activities provide recreational and economic opportunity for citizens and households in the state. During the past fiscal year, citizens spent over 11,950 days afield harvesting and viewing furbearer resources and spent over $43,965 while conducting harvest activities. A total of 13,887 furbearers were taken during the 1992-93 season. The harvest by species was: 1086 beaver, 8 bobcat, 95 coyote, 106 fisher, 149 otter, 118 red fox, 19 gray fox, 2,150 raccoon, 591 mink, 31 skunk, 60 opossum, and 9,474 muskrat. Private trappers who trap for recreation, food, and financial gain reduce wildlife populations at no cost to the general public. Residents of the state thus derive financial

savings due to decreased amounts of property damage caused by furbearers, as well as decreased need for paid control agents.

The Massachusetts Division of Fisheries and Wildlife heavily regulates the harvest of furbearing animals. Massachusetts has complex and restrictive laws and regulations that affect trapping, including:

1. Mandatory licensing of trappers
2. Mandatory trapper training
3. Restrictions on the size of traps
4. Restrictions on types of traps
5. Restricted seasons for trapping
6. Restricted areas for trapping
7. Mandatory regular checking of traps
8. Mandatory tagging of traps with the name and address of the trapper.

Public Education

Public education is a large part of furbearer management program. In the past year, furbearer project personnel gave 33 presentations to the public. Included were 13 presentations on rabies to 585 people, 4 presentations on Eastern coyote to 120 individuals, 6 presentations on beaver to 190 individuals and 10 presentations on general furbearer programs to 459 people. In addition posters and handouts on relocating wildlife, rabies, trapping and furbearer management, and beaver management were prepared. Slide shows on beaver management, coyote management, and proper fur handling were developed. These slide shows were duplicated and incorporated into educational programs being adopted for use in other states and provinces including: New York, Connecticut, Nebraska, Missouri, Maryland and Nova Scotia. Furbearer project personnel also gave over 125 interviews to print media and appeared on cable television and radio shows about coyotes and rabies, respectively.

Management and Research efforts

Pelt sealing: Pelt sealing is used to gain harvest information and distribution of beaver, otter, red fox, gray fox, bobcat, coyote, mink, and fisher statewide. In addition biological information on the sex, age, and reproductive status of the animal is gathered from selected species. During the 1992-93 harvest season, the Division pelt sealed 2763 animals. Fur harvesters are required by law to turn over specimens of particular harvested species which are examined for sex, age, and reproductive status. The Division collected and processed 263 specimens for laboratory examination during the 1992-93 year.

Furbuyer reports: Individuals receiving the pelts of wild animals must be licensed by the Division. These furbuyers are required to report the numbers and species of pelts they receive through purchases, bartering or they are given each year. License fees are $25.00 per year for residents and $75.00 per year for non-resident furbuyers. In 1992-93, 19 licensed furbuyers submitted annual reports for 13 various species of animals and represented a total of 6524 pelts. These pelts are typically used in the making of garments and other consumer products. The Massachusetts fur harvest contributes between one half and two million dollars per year into households in the state and contributes to the 1.2 billion dollar fur industry nationwide.

Wetland/beaver management: Because of active restoration programs, beaver now occupy all suitable habitat in Massachusetts. The Division receives 225-300 complaints of beaver causing property damage annually. The number of complaints about beaver causing property damage has increased steadily over the past five years. The Division investigates all beaver complaints it receives. Technical advice is given and sometimes flow devices are installed by Division personnel to create and maintain wetlands and alleviate property damage caused by beaver.

The Division has developed brochures that explain options to landowners discussing the positive and negative aspect of beaver activities, associated wetlands values and overall management of beaver. Public education, regulated harvest, and the installation of flow devices are major components of this program. Division management goals for beaver include recognizing beaver for their wetland values, regulating beaver populations within available habitat and minimizing economic damage to public and private property by beaver.

Wildlife depredation and damage

Division personnel responded to several dozen complaints by citizens of depredation on domestic livestock and pets by eastern coyotes, red foxes and gray foxes. Site visits and technical advice were conducted in efforts to eliminate or alleviate damage situations. New brochures were developed to help inform the public about wildlife and depredation problems. Complaints regarding eastern coyotes particularly from the southeastern and Cape Cod sections of the state continued to increase. Complaints range from coyotes killing livestock, poultry, domestic house cats and dogs to coyotes on airport runways threatening arrival and take-off of aircraft.

Disease program

Furbearer program personnel have been monitoring an outbreak of rabies in raccoon populations along the eastern seaboard since 1977. This epizootic has been spreading northward and is currently in bordering states of New York and Connecticut. This epizootic was documented in Massachusetts on September 16, 1992. Division personnel have implemented programs and plans that were prepared and outlined previously. The die-off of raccoons from this epizootic has been tremendous. Over 251 raccoons have tested positive for rabies.

In addition 2 foxes, 13 skunks, 1 cow, 3 cats and 4 woodchucks also tested positive. Within 1992-93 this disease was detected in 85 towns in the Commonwealth. Towns most affected have been in Southern Berkshire, Middlesex, Worcester and Suffolk counties. This epizootic greatly affected raccoon populations in the Commonwealth which were estimated at 200,000-265,000. Because the majority of the raccoon population occurs in areas of higher human population densities, the potential for interactions between raccoons and humans or domestic animals is very high.

In addition canine distemper continued to cause die-offs of raccoons and gray foxes. Sarcoptic manage also has caused a considerable number of local die-offs in red foxes and has been seen in the eastern coyote population.

White-tailed Deer Program

Division biologists were involved in research, management and educational activities that reached many citizens of the Commonwealth and led to better understanding and control of the state's estimated 70,000 white-tailed deer.

The major research effort was analyzing herd growth and population characteristics across the state. During the 1993 deer hunting seasons approximately 80,000 hunters harvested 7,871 deer. Division staff collected biological data on 37% of these deer. Yearling male antler beam diameters and deer weights indicated that the slowly increasing herd size has not affected the good physical condition of deer or their range.

A special deer hunt was conducted at the Quabbin Reservation during 1993; the third in as many years. This special, highly controlled, management-oriented hunt was developed jointly by the Division and the Metropolitan District Commission in an effort to reduce an extremely high population of deer that had been negatively impacting ecosystem health at Quabbin for years. During this management effort an additional 474 deer were harvested, 94% of which were examined for biological data by the Division.

Deer management goals have been established for each of the 14 deer management zones and for Quabbin Reservation. These goals were developed in order to control deer populations at levels (1) compatible with humans and human land use practices, and (2) compatible with the natural ecosystem's capabilities to support deer.

The basis of deer management in Massachusetts is control of female deer harvest during the shotgun season through the antlerless deer permit system. Nearly 41,000 sportsmen applied for antlerless permits during 1993 and the Division issued nearly 19,000. The $5.00 permit fee generated over $90,000 toward costs associated with managing wildlife resources. Archers and primitive firearms hunters contributed in excess of $150,000 to Division programs via purchases of a stamp that allows them to hunt deer during these special seasons. In addition, deer hunters in Massachusetts contributed millions of dollars to the state's economy through purchases associated with hunting (i.e. equipment, transportation, food and lodging).

Forestry Program

Progress was made on each of the forestry program's three objectives, which are:

1) Build a forest inventory data base, prepare a forest cover type map on the Massachusetts Geographic Information System (MASS-GIS), and establish property boundary lines in the field for each wildlife management area (WMA).

2) Use inventory data to design and carry out both commercial forest cutting operations and non-commercial management activities that improve wildlife habitat on, and human access into each WMA.

3) Determine the response of wildlife populations to forest cutting operations.

Forest Inventory Data Base

The forestry program continues to benefit from interaction with the Massachusetts Cooperative Wildlife Research Unit, and the University of Massachusetts Department of Forestry and Wildlife. Two undergraduate students from the UMass Forestry & Wildlife Department were hired through the Coop. Unit, and conducted forest inventory on a total of 1,200 acres on four different areas. These included 900 acres on the Phillipston WMA in the towns of Barre and Phillipston, 160 acres on the Reed Salmon Hatchery in Palmer, 140 acres on the Hiram Fox WMA in Chester, and 50 acres on the Sputtermill Pond WMA in Petersham.

Computerized mapping on MASS-GIS continued in FY94 with the completion of digitizing for a 2,100 acre portion of the Phillipston WMA in June, 1994. An updated draft of the forest type map compilation/ automation procedures was completed in May, 1994, and was used to prepare the Phillipston GIS map. Development of a companion database for the Phillipston WMA forest type map was initiated in June 1994 and will provide a summary of wildlife habitat related statistics including a distribution of forest successional stages on the WMA, as well as the basal area and stem densities for mast producing trees and shrubs.

A total of 5.5 miles (28,900') of WMA boundary line were established, including 3.1 miles (16,350') on the Phillipston WMA, 0.8 miles (4,000') on the Peru WMA, 0.7 miles (3,500') on the Chalet WMA, 0.5 miles (2,600') on the Reed Salmon Hatchery, 0.2

miles (1,250') on the Pout Water Brook WMA, and 0.2 miles (1,200') on the Raccoon Hill WMA. Of the total 5.5 miles, all was woodland boundary except for 0.2 miles (1,120') of road frontage on the Phillipston. All of the Phillipston WMA woodland boundaries were posted with aluminum DFW boundary markers.

Forest Cutting Operations & Management Activities

Two timber sales totalling 240 mbf of timber, 115 cords of firewood, and 225 cords of pulpwood over 42 acres were marked on the Swift River WMA in the town of Belchertown in FY 93, and were put out to public bid in FY 94. Both contracts were awarded to LeClerc & Son Logging of Belchertown, and involve shelterwood cutting in mature white pine and red oak forest. The first of the two sales (totalling 102 mbf timber and 115 cd fuelwood) was completed in May 1994. The second sale (totalling 138 mbf timber and 225 cd fuelwood) is scheduled to be cut in the fall of 1994. All required environmental permits were secured for these sales through the Massachusetts Department of Environmental Management.

Timber value from these sales is being realized in the form of in-kind services on the Swift River WMA. Services include improvement of existing access roads, mechanical site preparation for regeneration of red oak and white pine, and removal of poor quality, non-commercial stems to enhance growth of both mast-producing trees and timber quality growing stock.

Marking for a small cordwood sale was completed on the Sputtermill Pond WMA in Petersham, totalling 10 mbf timber and 80 cords of firewood over 20 acres. The sale will be put out for public bid in FY95. The objective of the sale is to regenerate poor quality oak forest to a mixed stand of good quality white pine and red oak using a shelterwood style cut.

A new timber sale was initiated on the Fox Den WMA in Worthington. A total of 150 mbf of timber and 200 cords of firewood have been marked to date. The completed sale will be put out to public bid in FY 95, and is expected to run about 300 mbf timber and 500 cords of firewood over 75 acres. The objectives of the sale are to improve wildlife habitat by regenerating areas of poor quality sawtimber size northern hardwood forest using shelterwood cutting and clearcutting, and to establish access into the WMA by reconstructing an abandoned road.

Non-commercial management work included one prescribed burn on the Hiram Fox WMA in Chester, and site preparation for white pine regeneration on a portion of the Hiram Fox WMA in Chesterfield. The forestry program's prescribed burning effort began in 1989 and the Division benefits greatly from cooperative efforts with the Massachusetts Department of Environmental Management, Bureau of Fire Control, who supply equipment and manpower for the burns.

A prescribed burn was conducted on a 0.5 acre clearing on the Hy Fox WMA in Chester in May, 1994. The primary objective of the burn was to maintain early successional stage habitat by setting back growth of the hardwood coppice in this 4-year old clearing. The burn achieved about an 80% kill of hardwood coppice. A secondary objective was to provide a wildlife observation area for people visiting the WMA. The burned clearing is located directly adjacent to the main access road into the WMA.

Site preparation on the Hy Fox WMA involved cutting and herbicide stump treatment of poor quality American beech saplings (1-3" dbh) growing in the understory of a mature forest stand of good quality white pine. The site preparation occurred over an area of about 5 acres and was designed to increase the likelihood of establishing good regeneration of white pine when the overstory is partly removed during a planned shelterwood cut. Without the site preparation work, the shade created by the beech saplings would likely prevent the desired regeneration of white pine.

Response of Wildlife Populations to Forest Cutting

A 1,000 acre area on the Hiram Fox WMA in Chester was censused intensively (1 station per 6 acres) for breeding songbirds in June, 1994. A total of 316 non-independent point counts were made in 1994. Identical censuses were conducted in 1988, 1990, and 1992. To date, 92 bird species have been recorded. There were no new species recorded in 1994. Bird species diversity did increase from 1988-1992 as a result of extensive forest cutting on the WMA, but has now stabilized. It should be noted that all resident bird species that occurred on the WMA prior to the start of cutting still occur today.

Future Work

Work planned for fiscal year 1995 includes forest inventory, boundary work, and a commercial timber sale on the Nissitissit River WMA in Pepperell, conducting forest inventory on new additions to the Phillipston and Fox Den WMA's, and completing commercial timber sales on the Swift River and Fox Den WMA's.

Massachusetts Cooperative Wildlife Research Unit

Impacts of Food on Black Bear Reproductive Success and Behavior: John McDonald

Hard mast was surveyed during line transects. Northern red oak mast was abundant. Of 12 cubs (5M:7F) produced in 1993 whose fate could be determined during 1994 den checks, 7 (1M:4F:2U) survived (58%). Two of three 1993 first litters were assumed to have been lost as the females had new cubs in their 1994 dens. The fate of the third (1M:1F) could not be determined as the female lost her radio collar. One other female lost her radio collar and the fate of her cubs (2M:1F) could not be determined. One additional female abandoned her litter (2M:1F) after a den check. Thirty-three new cubs (19M:14F) were produced in 13 litters in 1994. Milk samples were taken during the denning period from 12 of 13 lactating females. Ten of 12 females were recaptured after den emergence and additional milk samples were collected. Two females died during spring capture efforts, one in an attempt to replace the radio collar and one while biologists were attempting to collect a milk sample.

Cooperative Fish and Wildlife Research Unit

Furbearer Population Models in Wildlife Management: Tom Mahaney

This research project was initiated to help refine data collection and to increase the utility of data collected to improve methods of assessing changes in furbearer populations. Computer based mathematical models were analyzed for various sensitivities and usefulness for incorporation into the state's furbearer management programs. The application of these various computer models is being tested and four conceptual models are being developed for use with Massachusetts furbearer species.

Fisher Ecology Research: Eric York

The Division is sponsoring a research project investigating population dynamics, survival, and identify causes of mortality of fisher (*Martes pennati*) in central Massachusetts. This species is common and abundant throughout its range in the state. It is currently harvested under a regulated trapping season. Information gained from this project will be incorporated into current fisher management programs and will aid in refining area specific trends in fisher biology.

Wildlife Staff

Robert D. Deblinger,
Assistant Director for Wildlife Research

Robert Bellville, Permits
Richard Burrell Coordinator, Wildlife Mgmt. Areas
James E. Cardoza, Black Bear/ Turkey Project Leader
Thomas Decker, Furbearer Project Leader
Thomas Early, Wildlife Biologist
H Heusmann, Waterfowl Project Leader
Marcia Hartleb, Clerk
Sue Langlois, Wildlife Technician
John Scanlon, Forestry Project Leader
Gary Vecellio, Deer Project Leader

Ayer Game Farm

Stephen Foster, *Manager*
Robert Bennett
Mark Brideau
John Sheedy

Natural Heritage & Endangered Species Program

Dr. Thomas W. French
Assistant Director

Legislation & Regulations

A bill authorizing a Natural Heritage & Endangered Species automobile license plate, with proceeds from the sale of these specialty plates going into the Natural Heritage & Endangered Species Fund, was filed in both of the calendar years that straddle the fiscal year but neither bill progressed very far. Three plant species were added to the state's regulatory list of Endangered Species in January.

Data Management & Data Products

During this fiscal year, the Program produced the first "Natural Heritage Atlas" that combined both the maps of Estimated Habitat for rare wetlands wildlife and the maps of Priority Habitat for rare plants and wildlife into one volume with the two corresponding quadrangle maps printed on facing pages. These maps had been published in separate volumes during the preceding year. Geographic Information System (GIS) data were provided to a variety of federal and state agencies.

Environmental Review

One thousand and sixty five projects were reviewed in this fiscal year for their impact on rare species or other features of the state's biological diversity. Reviews included 36 forest cutting plans and 5 mosquito control projects. Notable projects under the Program's Wetlands Protection Act regulatory role included aquatic plant control at Jake's Pond in Plymouth and at Stockbridge Bowl and beach restoration issues at Norton Point in Edgartown. A vernal pool in Sudbury was protected by requiring setbacks with additional chemical restrictions applied to the upland portions of the property in a case that was the impetus for the passage of a town bylaw to protect non-certified vernal pools. Other notable reviews involved a quarry at Mount Tom, a major new landfill proposed for Douglas, a proposed pier on Clark's Island, a proposed expansion of the Miacomet golf course by the Nantucket Land Bank and an Eastern Spadefoot toad breeding site threatened by a subdivision in Wilbraham.

A total of 240 vernal pools were certified in fiscal year 1994. One hundred-five towns in the Commonwealth are now represented with at least one certified vernal pool within their boundaries. Of these, 18 had no Certified Vernal Pools prior to FY94. The town of Hubbardston had the most vernal pools certified in FY94, with 39; 24 were certified in Middleton and 23 in the town of Reading. The Reading Memorial High School's Vernal Pool Association was responsible for gathering information that led to the certification of 112 of the 240 certifications for FY94, covering 14 towns. The long-standing relationship between the Natural Heritage & Endangered Species Program (NHESP), the Massachusetts Audubon Society, and prominent Massachusetts herpetologists was continued with several joint presentations about vernal pool ecology and certification.

Land Protection

A major land protection objective of the Program — to protect Coastal Plain ponds — was significantly advanced this year with the acquisition on June 29th of 357 acres in Barnstable to protect the Hyannis ponds, also known as the Mary Dunn pond complex. The Division of Fisheries & Wildlife acquired the property from Independence Park, Inc. for just under $5.2 million by eminent domain after negotiations broke down. The property contains five Coastal Plain ponds and provides habitat for 15 state-listed rare species. After 14 years of biological inventory and research by the NHESP this site remained one of the most important unprotected concentrations of biological diversity in the Commonwealth. Land acquisitions by the Division identified by or of particular importance to the Program were:

Town	Acres	Natural Community Type Protected/ Comments
Barnstable	357	Five Coastal Plain ponds
Wellfleet	71	Salt marsh and small island
Nantucket	4	Inholding in an extensive sandplain grassland
Brewster	1	Small wetland with rare plants
Mashpee	5	Addition to Pitch Pine/Scrub Oak barrens property
Boxborough	26	Beaver impoundment with Great Blue Heron rookery
Rowley	73	Freshwater tidal marsh with rare plants
Colrain	30	River gorge with rare plants of northern affinities

The process by which the Division and the Department of Fisheries, Wildlife & Environmental Law Enforcement decide which lands to purchase was revised this year and formalized by the creation of a new Fish and Wildlife Lands Committee that met in January for the first time. This committee has on it representatives from the Fisheries, Wildlife and Natural Heritage sections of the agency to provide input on the natural resource value of proposed acquisitions.

Program Promotion, Presentations & Publications

Fund Promotion, Newsletter & Fact Sheets

Fund promotion activities were largely curtailed by the Program's budgetary problems, however a full page advertisement was printed in the winter issue of Massachusetts Wildlife magazine. The Program produced a shortened six-page one-color Natural Heritage newsletter in the spring but due to funding constraints, the Program did not produce a fall issue. A grant from the Department of Environmental Management's Forest Stewardship Program enabled the NHESP to prepare new or updated fact sheets for 50 rare woodland species.

Media Coverage

The Bald Eagle project activities were covered by Channel 4, Channel 56, and the NBC Nightly News. Numerous articles appeared in newspapers throughout the state on both the eagle and osprey projects. The Piping Plover also generated considerable news coverage.

Conferences and Presentations

Over twenty-five presentations were given during the year by Program staff to a wide variety of audiences. Conservation groups addressed included: The Trustees of Reservations, The Nature Conservancy, the Martha's Vineyard Conservation Society, the New England Wild Flower Society and several watershed associations. Lectures were presented to university classes at the Yale School of Forestry & Environmental Studies, Tufts Veterinary School, Tufts University and Framingham State College. Talks were also given to government audiences: conservation commissions in Plymouth and Sheffield, the Town Council in Barnstable and staff from the Department of Environmental Protection. Presentations were also made at conferences and annual meetings including: the Massachusetts Land Trust Conference, the Northeast Nongame Technical Committee meeting held in Lenox, the Massachusetts Association of Conservation Commissions, the Entomological Society of America - Eastern Branch, the 1994 Vermont Bird Conference, the Massachusetts Audubon Society's "Native Grasslands and Heathlands of the Northeast" conference and their annual meeting that focussed on endangered species ("On the Brink").

Program staff also served as academic advisors and were on the graduate committees of several Master's degree students.

Published Papers

Carroll, S.R. 1993. Tuning in to turtles and other small animals. Massachusetts Wildlife. 43(4):2-9.

Gibbs, J.P. and S.M. Melvin. 1993. Call-response surveys for monitoring breeding waterbirds. J. Wildl. Manage. 51(1):27-34.

Personnel

Jay Copeland left the Program in February after six years as the Program's Environmental Reviewer. Hanni Dinkeloo began work in May in this position. She is the first lawyer to work for the Division. Ann Kelley, previously with the North Carolina Heritage Program, joined the Massachusetts Program in December as the Assistant Data Manager.

Budget

Funding uncertainties dominated this year. A bill that would have required that the General Fund match the voluntary contributions that over 57,000 tax filers make annually on their state income tax forms, died in the legislature in August. Massachusetts General Law *was* amended to include fund matching language, however, the match is subject to appropriation and no General Fund appropriation was made.

The Fund donation total for 1993 was $270,984, down 4.5% from the 1992 tax year total of $283,671. Although tax form contributions clearly could not support it, the legislature appropriated $509,865 from the Natural Heritage & Endangered Species Fund for this fiscal year. Due to the continuing decline in contributions to the Natural Heritage Fund, the operating budget of the Program was maintained (at a reduced level) only by funding The Nature Conservancy contract through open space bond fund money earmarked for land acquisition planning, a major function of the Program. The Program's appropriations and expenditures under the Program's two line items were as follows:

Line Item	Appropriated	Expended
Nongame Mgt. account	$ 401,383	$ 155,903
Nat'l Heritage account	$ 216,964	$ 205,611
TOTALS	$ 618,347	$ 361,514

Birding at Bolton Flats.

Inventory, Research & Species Management

Small Research Contracts Program

In January, 39 proposals were received requesting over $84,000. for 1994 field inventory and research projects. The funded projects will be discussed in the fiscal year 1995 annual report.

For the 1993 field season, 31 projects were funded for a total of approximately $43,000.

Small Research Contracts Funded, 1993 Field Season were:

Vertebrate Wildlife

J. Hatch	Demographic study of Roseate Terns
J. O. Hill and S. D'Angona	Piping Plover monitoring in Bristol County
P. Robakiewicz	Radio telemetry study of wood turtles
V. Rough	Gray Seal population study
E. Strauss	Piping Plover monitoring

Invertebrate Wildlife

E.A. Colburn	Inventory of aquatic insects and habitats
P.Z. Goldstein	Insect survey on Martha's Vineyard
P. Goldstein, D. Primozich, and M. Thomas	Study of insects in calcareous fens in Berkshire County
S.M. Lewis	*Photinus* firefly survey in Middlesex Co.
M. Mello, V. Carpenter, and W. Sigmund	Odonate survey of Coastal Plain Ponds in Plymouth County and adjacent areas
M. Mello	Lepidoptera survey of Atlantic White Cedar Swamps
C.A. Menzie	*Lampsilis cariosa* distribution in CT River
P. Nothnagle	Monitoring of Northeastern Beach Tiger Beetle
P. Nothnagle	Monitoring of Puritan Tiger Beetle and Elderberry Long-horned Beetle
J.A. Shetterly	Tiger Beetle survey of Fort Devens
B. Windmiller, D. Monahan, and R. Walton	Study of Elderberry Long-horned Beetle in Concord

Plants

S. Cooper-Ellis	Rare Bryophyte identification in old growth forests
A.C. Dibble and C.S. Campbell	Taxonomic status of Nantucket Shadbush
M. Digregorio	Correlation study of shell midden sites and occurrences of *Triosteum perfoliatum*
S. Hammer Myles Standish	Analysis of *Cladonia* lichens in State Forest in Plymouth
R. Kesseli	Genetic work with *Viola brittoniana*
E.J. Kneiper, E. Lay, and M.H. Davis	The Lichen Flora of Boston
L. Sanders	Inventory for two species in CT River Valley
P.B. Weatherbee	Survey for *Carex formosa*
S.A. Williams	Population monitoring of *Triphora trianthophora*
S.A. Zielinski	Population studies of *Viola brittoniana*

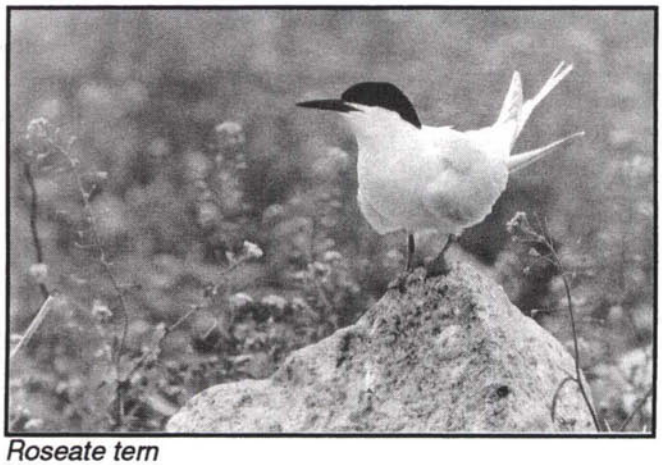
Natural Communities

G. Motzkin and D.R. Foster	Inventory of natural community types, CT River valley
K.B. Searcy and P. Alpert	Study of CT River valley deciduous swamps
S. Shumway	Comparative study of coastal dune seed banks.

Field Season Accounts, 1993

Birds

Piping Plover - A total of 289 breeding pairs of Piping Plovers occurred at 67 sites in Massachusetts in 1993. This was the highest count since statewide surveys began in 1985, and represented an increase of 76 pairs (36%) over the 1992 count of 213 pairs. Overall mean productivity was 1.92 chicks fledged per pair, based on data reported for 264 of 289 pairs (91%) at 60 of 67 sites (90%). This was the second highest statewide productivity achieved to date. Hatching success was 66% (656 of 996 eggs hatched) and fledgling success was 65% (429 of 656 chicks survived to fledge). We attribute these continuing population increases and



Roseate tern

relatively high productivity to intensive management to minimize adverse effects of predation, habitat alteration, human disturbance, and off-road vehicles on plover survival and reproductive success. Monitoring and management activities for Piping Plovers in Massachusetts are carried out by a statewide network of biologists and land managers, coordinated by the Division in cooperation with the U.S. Fish and Wildlife Service. The Program Zoologist served as a member of the Massachusetts Barrier Beach Task Force, charged by the Executive Office of Environmental Affairs to develop comprehensive guidelines for protecting and managing the natural and recreational resources of Massachusetts coastal barrier beaches. A final report entitled "Guidelines for Barrier Beach Management in Massachusetts" was released in February 1994.

Terns - After tumbling 13% in 1992 from the previous year to 8,601 pairs, **Common Tern** numbers rebounded a modest 4% in 1993 to reach 8,937 pairs. Thirty-five stations were occupied, the same as in 1992. The colony at Plymouth Beach, the largest in New England, increased 21% over 1992 to reach 3,721 pairs. This important colony harbored 42% of all the Common Terns nesting in the state in 1993. The Program has continued to work with the Town and Plymouth and the Massachusetts Audubon Society's Coastal Waterbird Program to facilitate good management at this site. An additional 9 sites harbored >100 pairs and, together with Plymouth accounted for 95% of all nesting Common Terns in the state. Some 76% of the Common Tern population was contained in the 3 largest colonies: Plymouth Beach, Bird Island in Marion and Nauset Beach in Chatham.

All other species of terns were about even with 1992 or declined in 1993. The endangered **Roseate Tern** declined for a second consecutive year, slipping 4% over year earlier estimates to 1,355 pairs. Bird Island in Marion harbored 97% of these birds. Bird Island, together with Great Gull Island in New York, contain about 85% of the endangered Northeastern population.

Only 7 pairs of **Arctic Terns** were located in 1993, an all time low since records have been kept. Despite stringent protective strategies in place at nesting sites, the Arctic Tern population seems to be gradually withdrawing from the southern fringe of its range in Massachusetts.

The final estimate of our **Least Tern** population gathered from cooperators in the extensive site monitoring network was 2,622 pairs, essentially even with 1992 results. It is quite likely this estimate would have been much higher—into record territory—were it not for undercoverage at several stations and difficulties in counting an enormous colony (732 pairs) at Nauset Beach in Orleans. Least Terns nested at 43 stations in 1993. In addition to Nauset-Orleans, other large colonies (>100 pairs) were recorded at Norton Beach in Edgartown (510 pairs), Great Point, Nantucket (162 pairs), Sylvia State Beach in Oak Bluff (154 pairs), Plymouth Beach (145 pairs) and at Race Point Coast Guard Station in Provincetown (112 pairs). The Least Tern has benefitted serendipitously from aggressive plover management strategies in effect throughout the state. In addition, vigorous coastal storms in recent years have created superlative nesting substrate conditions for this species at many sites. The outlook for this species is more positive than for the larger terns, though maintenance of the population is clearly dependent upon protective strategies and good stewardship of our barrier beaches.

Ram Island Project

The State Ornithologist attended two meetings of the Roseate Tern Recovery Team in 1993. A central part of the Roseate Tern Recovery Plan calls for restoration of historic nesting stations in the species' core range. Massachusetts has led the way in this regard, launching an aggressive project at Ram Island, Mattapoisett designed to restore the site as a ternery. The Division has owned Ram Island since 1925, when it was conveyed to the Commonwealth by the Federation of New England Bird Clubs.

After nesting at Ram Island in 1992 for the first time in 20 years, Common Terns increased further in 1993, consolidating their position on the island. Up to 98 pairs of nesting Common Terns were estimated in mid-July. On June 29, a milestone was passed as Roseate Terns were noted landing in the colony with Common Terns. By mid-July, 2 pairs of Roseate Terns were confirmed with one nest located and photographed.

Human activity on the island was cut back in 1993 in favor of a less labor intensive gull shooting program designed to take out gulls intending to nest just prior to the arrival of the terns in early May. Personnel spent 61 hours on the island, down 62% from 160 hours a year earlier. A total of 84 gulls were shot and 51 nest starts were destroyed. While this

operation was largely successful, a "core group" of up to 20 pairs of gulls continued to plague the island—attempting to renest and preying on tern chicks.

Gull production at Ram Island has now been completely suppressed for 4 consecutive years. Since operations began in 1990, 1,222 gulls have been removed (995 using gull toxicant '1339' and 227 by shooting) and 1,332 nest starts broken-up. Double-crested Cormorants abruptly vacated the island in 1991 after 2 years of harassment.

In summary, 1993 was a year of major progress in further suppressing gull activity on Ram Island and in rebuilding the ternery there. In a year marked by the first major nesting of terns on Ram Island in over 20 years, it was also painfully evident that despite the fact that gulls have been largely removed as a competitor for space, they remain a formidable predator. Complete restoration of the ternery will depend on continued commitment of human resources to "tend" the island. We expect that with careful attention, the outlook is bright for continued increase and recovery of both Roseate and Common Terns at this valuable site.

Wetland Birds - In 1993 we completed a fourth year of field surveys to determine population status and habitat use of state-listed and uncommon wetland birds in Massachusetts. Field assistants Michelle Anderson and Debbie Moreau surveyed 58 freshwater and brackish wetlands distributed throughout the state. Field surveys were conducted from May 5 through July 8 and used playbacks of tape-recorded vocalizations to increase detection rates of inconspicuous species. Numbers of wetlands where state-listed or uncommon species were detected during 1993 surveys were: Pied-billed Grebe (2), Least Bittern (3), American Bittern (5), King Rail (1), Clapper Rail (1), Common Moorhen (0), Sora (5), Common Snipe (3), and Marsh Wren (13).

University of Massachusetts-Amherst graduate student Shawn Crowley, under the direction of Scott Melvin, completed analysis and an initial draft of his M.S. thesis, analyzing and synthesizing four years of data on the status and habitat use of inconspicuous wetland birds in Massachusetts. Our wetland bird studies are funded by the U.S. Fish and Wildlife Service, U.S. Environmental Protection Agency, and the Division, in cooperation with the Massachusetts Cooperative Fisheries and Wildlife Research Unit.

Partners in Flight - The Massachusetts Partners-in-Flight Working Group (Working Group), chaired by the State Ornithologist, met several times in early 1994. In February, the Program, in consultation with the Working Group, initiated a pilot Forest Bird Monitoring program to establish a set of forest bird surveys around the state using point counts. The purpose of this program is to monitor long-term population trends of forest-nesting birds across a broad spectrum of habitat types in Massachusetts. The Working Group also approved new "Nesting Season Forest Bird Survey Standards" to encourage uniform implementation of point counts among different interested agencies, particularly those within the Executive Office of Environmental Affairs. The Program continued its monitoring efforts at the Hiram Fox WMA in 1993. The Working Group worked on a State Partners-in-Flight Model Plan for completion in FY95. Subgroups are preparing different sections of the plan which include: Information & Education, Monitoring, Management, Research and International. This plan will include strategies for the conservation of neotropical migratory birds in Massachusetts.

Bald Eagle Project - Nine pairs of nesting Bald Eagles were observed in Massachusetts in 1993. Six of the pairs nested successfully producing a total of 10 young. Two nests were made up of "housekeeping" adults, birds that occupied a nest and territory but were not observed incubating. The final nest failed early in the nesting season, possibly of raccoon predation. The nesting eagles have expanded their range and now are found at Quabbin Reservoir, on the Connecticut River and most recently in Plymouth county on the Assawompsett Pond system.

The Midwinter Bald Eagle Survey was conducted on January 7, 1994 and documented 54 Bald Eagles and 2 Golden Eagles from seven stations statewide. Both Golden Eagles and 37 of the Bald Eagles were recorded at Quabbin Reservoir. Helicopter flight time was donated by Massachusetts Electric. Observations of leg-banded bald eagles were made on six days during the winter of 1993-'94. A total of 12 banded eagles were identified. They originated from the Massachusetts hacking project, and wild nests in Massachusetts, Maine and New York. A maximum of 24 unduplicated eagles were recorded at the observation blind on February 6, 1994.

Osprey Recovery Project - Osprey numbers were again up for the 1993 nesting season with reports of 251 nesting pairs received. Data were compiled in the fall of 1993 and showed an increase in range and variability in nesting success. The birds continued to reproduce at the replacement level of 0.9 - 1.0 young per active nests in areas where productivity was down from previous years. Ospreys were documented nesting for the second consecutive year in Middlesex County, a major inland jump. Problem osprey nests were relocated in the towns of Falmouth, Mashpee and Barnstable by ComElectric under direction of the Division.

Common Loon Project - Although in 1993 Massachusetts continued to hold the 11 territorial pairs recorded in the previous year, productivity was the worst since 1986. For some reason, a higher number of pairs than usual - 3 or over a quarter - opted not to nest at all in 1993 and appeared restless and erratic on their traditional territories. Of the eight pairs that did nest, only two successfully produced chicks. Predation in one form or another was believed the likely cause of failure of the other six nesting pairs. The two successful pairs each fledged two chicks giving a seasonal total of only four chicks.

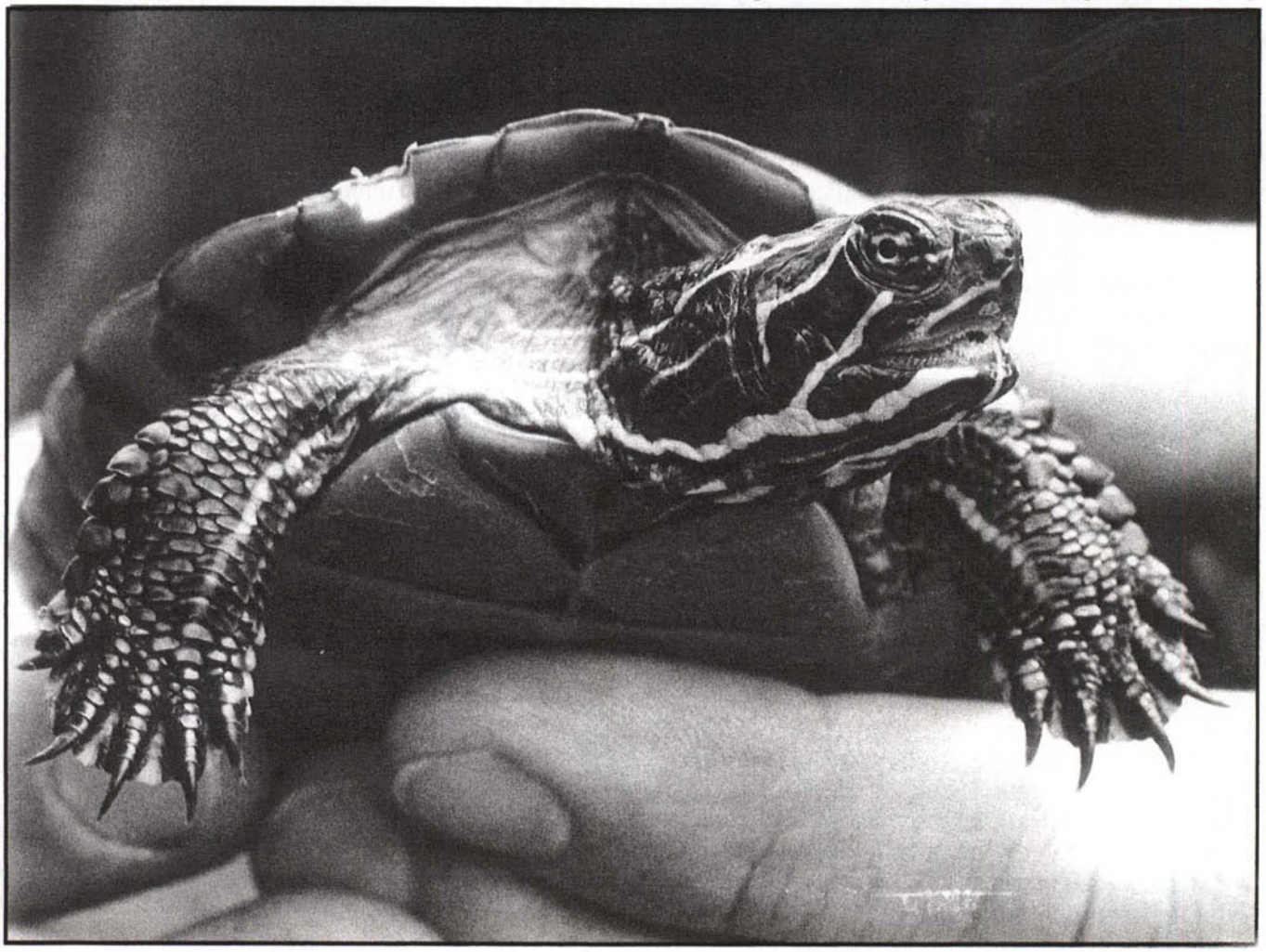
Peregrine Falcon - This endangered raptor again nested successfully in both the cities of Boston and Springfield. The resident adults at both sites are the same individuals that nested in 1992. Four chicks (1 male, 3 female) were produced in Boston and a single male chick fledged in Springfield. An intruding female was observed at both sites during the egg-laying period. In Boston, the resident and invading female locked talons on a 19th floor office building terrace and engaged in an 3.5 hour battle. Both females left the scene bloodied and tattered. The battle occurred after the first egg was laid, and that egg was subsequently abandoned and removed. The clutch of 4 eggs, which hatched successfully, was then produced. In Springfield, a marauding female disrupted the resident pair, resulting in only a 2 egg clutch being produced. The resident female was missing after the 1st egg was laid, returned to lay a second egg, and then disappeared for another five days. One of the eggs hatched and the second was removed and found to be infertile.

Mammals

Gray Seal - During the late winter of 1994, 59 Gray Seal pups were observed in Massachusetts, almost twice as many as the approximately 30 recorded the year before. The aerial count of total number of individuals increased to 2035, up from the perhaps incomplete, but greatly increased, count of 1549 recorded the year before.

Reptiles and Amphibians

Plymouth Redbelly Turtle - Dr. Terry Graham of Worcester State University continued to be the principal investigator on the Redbelly Turtle research and restoration effort. Between June 7 and July 9, 1993 a total of 71 nests were located and protected at the primary breeding pond. Sixty seven of the 71 nests produced 898 eggs with an average of 13.4 eggs per clutch and a hatch rate of 80.6%. From these nests 522 hatchlings were released directly into the pond and 153 were retained for headstarting by seven cooperating educational institutions and two individuals. An additional 49 hatchlings died shortly after emergence. Twenty



nine Redbelly Turtle nests allowed to overwinter naturally from the previous year contained 378 eggs. Of these, only seven hatchlings (1.9%) survived until they were discovered in the spring and two of these died shortly after. Considering this low rate of survival for hatchlings that have not emerged by late fall, a protocol was initiated whereby in the future any remaining eggs will be dug up for headstarting. A total of 126 hatchlings were held over the past winter (1992/93) for headstarting. Of these 112 were released at four sites in Plymouth County on June 1, 1993, nine were held for continued headstarting, and five died. The survival rate of 96% continues to be impressively high.

Spotted Turtle - In 1993 we began a study of Spotted Turtle demographics and habitat use through the Massachusetts Cooperative Fisheries and Wildlife Research Unit and in cooperation with the Northeast Forest Experiment Station of the U.S. Forest Service and the University of Massachusetts-Amherst. The goal of this research is to gather information necessary for protection and management of habitat for Spotted Turtles, classified as a Species of Special Concern in Massachusetts. Objectives include characterizing population densities, home range sizes, and movement patterns, and determining relative importance of wetland and upland habitats. Under the direction of Scott Melvin, graduate student Joan Milam began research in spring 1993 at a study site in the Quabbin Reservation, where she captured and radio-tagged 12 Spotted Turtles. Preliminary results from Joan's first field season indicate that vernal pools were important feeding habitats in spring, and that turtles remained inactive in upland forests for longer periods in summer than anticipated. A second year of research is planned for 1994, when the project will expand to a second study site in the Amherst area. Funding is provided by the Division, U.S. Forest Service, and the University of Massachusetts.

Invertebrates

Regal Fritillary - The Division continued to coordinate a program to develop captive-rearing techniques for Regal Fritillary butterflies and undertake laboratory and field investigations to determine factors responsible for the disappearance of this species in the Northeast. Our goal is the eventual reestablishment of wild populations of this butterfly in southern New England. With support from the U.S. Fish and Wildlife Service, the Sweet Water Trust, and the Division, 3 captive colonies of Regal Fritillaries were established at the University of Massachusetts-Amherst (Dr. Joe Elkinton), the University of Connecticut-Storrs (Dr. David Wagner), and Papillon Park, Westford, Mass. (Mr. George Leslie), with eggs produced by wild females taken from Pennsylvania. Efforts in 1993 were directed at testing methods to improve larval survival in captivity, including varying temperature, humidity, photoperiod, and food plants. Cooperators in 1993 successfully reared larvae, chrysalises, and healthy adults and produced eggs in the laboratory; however, larval survival and mating success of captive-reared adults was poor. Research with subsequent cohorts will seek to improve larval survival, mating success, and egg production, in order to produce captive populations that are large enough to be self-sustaining and support investigations of limiting factors.

Northeastern Beach Tiger Beetle - The population of Northeastern Beach Tiger Beetles on Martha's Vineyard was monitored during summer 1993 by Dr. Philip Nothnagle under contract with the Division of Fisheries & Wildlife. Peak population size was 220 adults seen on July 18, down from previous highs of 926 and 799 adults observed in 1991 and 1992, respectively. This decrease in abundance is believed to be the result of larval mortality and severe beach erosion caused by Hurricane Bob and a severe October storm in 1992.

Mark-recapture population estimates were 1.2 to 2.6 times greater than numbers of beetles counted in strip censuses. Fall counts of larvae indicate that numbers of beetles should increase in 1994. Because of low numbers of adults censused, no beetles were translocated to the Cape Cod National Seashore in 1993.

Puritan Tiger Beetle - Four sites along the Connecticut River in Northampton were monitored for Puritan Tiger Beetles during July and August, 1993, by Dr. Philip Nothnagle under contract. Only 13 adults were observed, all at one site. No beetles were observed at the other 3 sites. This is the lowest number of *C. puritana* recorded in Massachusetts since the censuses began in 1987.

American Burying Beetle - For the fourth consecutive year a group of federally endangered American Burying Beetles was released on the Division's Penikese Island Wildlife Sanctuary. This is expected to be the final year of release but will be followed by at least five years of close monitoring to document the long-term status of this population and to evaluate whether or not the restoration effort was a success. In 1993 a total of 60 adult beetles from the captive breeding colony at Boston University (55) and from the wild population on Block Island (5) were released. This brings the total number of adults released on Penikese Island between 1990 and 1993 to 211. An estimated 377 young beetles were thought to have been produced from the 1993 released adults. An exciting discovery was a brood of 16 larvae found on a Herring Gull chick which had been buried by a "wild" pair of American Burying Beetles. Trap results from two monitoring visits (July 5-7 and 15-17) were dismal. Only one American Burying Beetle was captured, but these

poor results were thought to reflect trap periods that were too late in the season, poor bait, and a prevalence of natural food in the form of gull chicks. Trap success for the other common species of burying beetles was also poor. On Nantucket a contracted survey for burying beetles yielded three common species but no evidence that the American Burying Beetle remains. Ten sites were trapped for 480 trap nights beginning on June 19 and ending July 4, 1993. A total of 422 burying beetles were captured and released. In 1994 the ongoing restoration program will expand to include the first releases of American Burying Beetles on Nantucket.

Plants

Federal Funding and Subcontracts

The NHESP's survey of the complete vascular flora of Camp Edwards Military Base on Cape Cod resumed via a subcontract to Jerry Jenkins who continued the inventory and collection of specimens begun in the fall of 1992. Funding from Fort Devens was obtained and channeled into completing a floristic inventory of the military base, monitoring known populations of rare plants, and conducting vegetation sampling and classification in the bottomland forests along portions of the Nashua River. This work was conducted primarily by a University of Massachusetts team led by Dr. Karen Searcy, and the floristic inventory work was aided by Dr. David Hunt who had begun the base inventory in 1991. In all 100 new taxa were found bringing the base total to 870 vascular plant taxa. Funding was obtained for flora and vegetation studies at Westover Air Reserve Base in Chicopee. A workplan was developed, and a subcontract to Jerry Jenkins for the 1994 field season to conduct part of the work was prepared. A second contract, for a lichen survey of the base, was awarded to a team of lichenologists associated with Harvard University's Farlow Herbarium.

Several grants from the U.S. Fish and Wildlife Service (USFWS) assisted the Program's conservation activities and research on federally listed plant species and a couple of candidates for federal listing. Using these funds, management research was begun on two Federally listed members of the Figwort family, *Agalinis acuta* (Sandplain Gerardia) and *Schwalbea americana* (American Chaffseed). A contract with the Massachusetts Audubon Society was arranged in order to attempt the restoration from dormant seed of the latter plant (a fire-adapted species) at an historical site on Nantucket. Planning, experimental design and vegetation sampling were conducted, but lack of permission to conduct an experimental burn prevented implementation of the project during the 1993 field season. In the case of Sandplain Gerardia, about 5% of the seed from one of two extant populations on Cape Cod was harvested for use in experimental management treatments (fire and soil scarification) in the spring of 1994.

"Pre-listing recovery" funds were also received from the USFWS for investigations of two federal candidate taxa: *Eupatorium leucolepis var. novae-angliae* and *Carex polymorpha*. Funds for the former were awarded to the Biology Department at the University of Massachusetts-Boston to do population estimates and a threats analysis at eight sites in southeastern Massachusetts where the species was considered extant. This study showed that most populations were much larger than previous estimates had suggested. The funds for *Carex polymorpha* supported searches for new populations of this sedge. Except for updates on the two known sites, these efforts were not successful.

NHESP Small Research Contract Projects

Results of genetic studies on two federal candidate taxa funded in FY92 were received. A study by Dr. Victoria Sullivan presented convincing data that *Eupatorium leucolepis var. novae-angliae* should be recognized as a new species distinct from the southern coastal plain *E. leucolepis.* The other study by Dr. Jay Raveill concluded that *Desmodium humifusum* is of hybrid origin. New genetic studies were initiated with Dr. Rick Kesseli in order to investigate two varieties of *Viola brittoniana* and *Pycnanthemum clinopodioides*. Dr. Sally Zielinski was funded to continue her multi-year monitoring and habitat studies of *Viola brittoniana* populations. Pamela Weatherbee, funded to investigate habitat of *Carex formosa,* turned in data from three sites in Berkshire County. Susan Williams was reimbursed for expenses associated with her sixth year of monitoring Nodding Pogonia, *Triphora trianthophora.* Her detailed study, no doubt, represents the best data available regarding the demographics and life history of this orchid. A summary of the six year study was published in *Rhodora* in 1994. Another species sought using NHESP funds was Broad Tinker's-weed; Mario DiGregorio, who has discovered two sites for this species on Indian shell midden sites, did surveys of other shell middens but was unsuccessful in locating additional populations.

Several studies of non-vascular plants were funded this year. Dr. Samuel Hammer initiated a study of the effects of off-road vehicle use on the lichen flora and community structure at Myles Standish State Forest. Elizabeth Kneiper was reimbursed for expenses incurred while creating a database on the lichen flora, past and present, within the Boston metropolitan area. A final contract supported the Master's thesis study by Sarah Cooper-Ellis of bryophytes in "old growth" forest stands in Massachusetts.

New England Plant Conservation Program (NEPCoP)

The State Botanist actively participated in all aspects of the NEPCoP agenda administered through the New England Wild Flower Society. Working with a committee of regional botanists, he helped begin a comprehensive review of New England's flora in order to identify species that are regionally rare. Working with a team of state plant conservationists called the Massachusetts Task Force, he helped develop an action agenda of 88 priority assignments that resulted in 68 surveys and 48 rare plant rediscoveries and updates. A third aspect of NEPCoP, a Volunteer Conservation Corps, was launched in Massachusetts in 1993, yielding 51 surveys and 32 rediscoveries of rare plant populations documented in the Heritage database.

Field Inventory and Research

Contractors working on the federally-funded and small research contract projects described above, NEPCoP participants, NHESP staff and naturalist supporters all made significant contributions to the Program's botanical field objectives in 1993. At Fort Devens, for instance, two new rare plant records on the base were discovered during the 1993 survey (*Sparganium minimum* and *Cassia hebecarpa*). A very significant NEPCoP volunteer contribution came from Marylee Everett of Burlington who turned in a second extant record for *Carex polymorpha*. Another NEPCoP volunteer, Therese Thompson of Harvard, traveled the entire state visiting herbaria in search of historical and extant records of New England Blazing Star, *Liatris scariosa var. novae-angliae,* a candidate for federal listing, thus documenting its apparent loss from about 63 Massachusetts towns. A long time friend of the Program, Charles Quinlan of Cummington, reported rediscovery of *Agastache scrophulariifolia,* a species last known in Massachusetts from a 1949 collection.

Working on federally listed taxa, Program botanists were involved in rediscovering fruiting plants of the Northeastern Bulrush, *Scirpus ancistro-chaetus*, at its only Massachusetts site, updating records for Small Whorled Pogonia, *Isotria medeoloides,* assisting with vegetation sampling at an historical site for American Chaffseed, *Schwalbea americana*, and censusing and harvesting seed from populations of Sandplain Gerardia, *Agalinis acuta.* Also, several sites for Long's Bulrush, *Scirpus longii,* and *Liatris scariosa var. novae-angliae,* both candidates for federal listing, were updated during the growing season.

The Program Botanist continued editing the *County Checklist of Massachusetts Plants* and overseeing the development of the computer data base for the county flora.

Natural Communities

Natural community types of special focus continued to be sandplain grasslands, pitch pine barrens, Coastal Plain pondshore communities, calcareous fens, and Atlantic white cedar swamps: research on the three wetland types was included in a grant the Program received from the U.S. Environmental Protection Agency. Coastal Plain pondshores were visited by the Program Ecologist and small research contract investigators to conduct community descriptions, inventory, rare species monitoring, and some litter clean up work and control of aggressive non-indigenous species (*Phragmites*).

The Program Ecologist worked on 12 prescribed burns, most of which were for sandplain grassland restoration and management. As is usual with prescribed burns, many public and private conservation organizations cooperated to provide crew members and properties for restoration. The Division sponsored a burn at the Cape Cod Airport in Barnstable and that crew went on to burn some Falmouth town conservation land. The Barnstable burn site and other past burns in grasslands (including a wildfire site at Crane Wildlife Management Area) were visited to monitor the results. Potential future burn sites were checked and site preparation or monitoring begun, including the Division's 'North Triangle' parcel at Katama on Martha's Vineyard. Several Program staff attended meetings to continue to develop vegetation restoration plans for the Manuel F. Correllus State Forest on Martha's Vineyard.

Old growth forest occurrences continued to be tracked, and the sites that were reported from a small research contract were mapped and entered into the Program data base.

Natural Heritage & Endangered Species Program Staff

Thomas French, *Assistant Director*

Henry Woolsey, *Program Coordinator*
Henry Barbour, *Habitat Protection Specialist*
Bradford Blodget, *State Ornithologist*
Bill Davis, *Eagle Project Leader*
Hanni Dinkeloo, *Environmental Reviewer*
Gretchen Eliason, *Manager of Information Systems*
Patricia Huckery, *Wetlands Environmental Reviewer*
Diane Lauber, *Secretary/Environmental Review Assistant*
Scott Melvin, *Rare Species Zoologist*
Ann Kelly, *Assistant Data Manager*
Paul Somers, *State Botanist*
Patricia Swain, *Plant Community Ecologist*

Nongame Advisory Committee

The Committee mourned the loss of Abigail Avery, an associate member since 1984, who died of a stroke on December 21, 1993. Abigail was a passionate supporter of the Natural Heritage & Endangered Species Program and a wide variety of other environmental causes.

The Committee continued to provide advice to the Division on the breadth of nongame wildlife issues. As a result of the Committee's extensive review of exotic species, the Division dedicated the Spring 1994 issue of *Massachusetts Wildlife* magazine to the topic. Five of the seven articles in this issue were authored or co-authored by Advisory Committee members. Another publication resulting from the Committee's exotic species review is "Exotic and Translocated Vertebrates of Massachusetts" (2nd ed.) by J.E. Cardoza, G.W. Jones, T.W. French, and D.B. Halliwell. Fauna of Massachusetts 6:106 pp. published by the Division.

Other issues taken up by the Committee included:

- Review of the 1993 small research contract project results;
- Review of the small research contract proposals for 1994;
- Review of the annual promotional campaign for the Natural Heritage Fund;
- Review of the Program's proposed annual budget;
- Discussion of proposed changes to the list of endangered, threatened, and special concern species;
- Review of the draft Nature Preserves regulations;
- Review of the Division's land acquisition process;
- Review of the agency's forestry and wildlife habitat management program; and
- Discussion of potential funding opportunities for the Program.

Full members during the year were: Gwilym Jones, chair; Kathleen Anderson, vice-chair; Marilyn Flor, secretary; Jim MacDougall, archivist; Barre Hellquist; Tim Simmons; and Pamela Weatherbee. Associate members were: Abigail Avery (until her death, 12/93); Chris Leahy, Mark Mello; and Mark Pokras.

Nature Preserves Council

The Nature Preserves regulations were finalized and published in the Code of Massachusetts Regulations as part of the Division's regulations in March. The enabling statute allows any lands controlled by an EOEA agency to be eligible for Nature Preserve designation. Staff from the Department of Environmental Management and the Metropolitan District Commission, as well as the Division, reviewed the draft regulations and many of the comments were incorporated into the final version of the regulations. Each agency will be responsible for nominating lands on their own lands, and each agency continues to be represented on the Nature Preserves Council by up to two formal associate members. Agencies will continue to be responsible for management of any Nature Preserves designated on their lands, but they are encouraged to consult with the Council and the Natural Heritage & Endangered Species Program for advice and aid in that management. A management plan is to be written (by the agency with help from the Council or NHESP) for each nominated Nature Preserve before that land can be designated as a Nature Preserve. In FY94, the Nature Preserves Council visited two sites that are potential nominations (Maple Hill in West Stockbridge and the Mashpee pitch pine barrens). Regional Division staff and local officials were included in the visits, and often provided histories of the sites, with suggestions and comments on their management.

Information & Education

Ellie Horwitz
Chief, Information & Education

The Information and Education Section is charged with the responsibility of keeping the public informed about wildlife situations, regulations, projects and programs. It provides news about wildlife and maintains a flow of information on wildlife related issues. In order to enhance public understanding of wildlife matters and facilitate law enforcement, the Section maintains an active program of educational outreach to develop a public which is aware of and in tune with wildlife issues.

New for 1994

In an effort to provide better service to the media and to speed the distribution of news from the Division of Fisheries and Wildlife to clubs and other groups receiving news releases, the Section **inaugurated a fax distribution system** for press releases. This service, which is available to media representatives, currently reaches 40 print and electronic journalists providing them with news the instant it is released. This is part of an effort to reach into the world of **electronic outreach** a project that is being explored further through the use of Simmons College's EcoNet.

During this period the Division also established **1-800-ASK-FISH**, an angler's hotline. This program provides callers with information about fishing locations, activity, records and much more through a branching telephone system. Data is collected and listings are updated by Fisheries Section staff. The telephone system was inaugurated on April 14 with Governor William F. Weld making the first call on the new system and an ensuing reception in the Governors' chambers.

A key issue of concern for biologists and for teachers has been the advent of raccoon-borne rabies. To help teachers alert and inform their students, the Section developed **rabies education materials** including background material for teachers, and lessons, puzzles and activities for primary grades, middle school and high school.

Another publication prepared to assist teachers was a draft of a booklet on addressing conflicts and natural resources controversies in the classroom. The resulting publication, **"Tackling the Tough Ones"** provides teachers with activities that assist in developing an open climate in which learners can explore emotionally-loaded issues such as the ones that often emerge in connection with wildlife management. Students are encouraged to explore locally hot topics. Two case studies offered are, "Management of the Quabbin Deer Population" and "Should Wolves be Re-Introduced in Maine?" Production of this material was jointly sponsored by the DFW and the U.S. Forest Service and Cooperative Extension Service.

In an effort to streamline service to the public, the Division began a major **reorganization of the Field Headquarters**. This will greatly enhance the efficiency of communications within the Section. Regrettably the move will eliminate the space used by the Division's small museum. This shift in office locations is proving to be extremely time consuming for all who are or will be moving including all of the Information & Education staffers.

Information Services

Response to Public Inquiry

During this period, the number of public inquiries received by mail, telephone and in person continued to increase as did the demand for DFW participation in fairs and exhibits. The Section Chief fielded a majority of calls from persons concerned about the presence of bats. Editor Peter Mirick handled questions and inquiries related to reptiles and amphibians. All staff members were involved in responding to inquiries about wildlife populations, regulations and management practices.

Media Services

During calendar year 1993, the Section issued 28 press packets (7 more than last year) comprising 100 release items (11 more than last year); an increase from the 21 packets and 89 items issued in calendar year 1992. This increase primarily reflects several new programs and proposed or actual changes in regulations this year including allowing the use of mechanical releases on bows, turkey hunting safety, the controlled deer hunt at Quabbin, "bonus" salmon, the license display requirement, land stamp and primitive firearms regulations. It also reflects a continuation of our effort to improve the press coverage of individual items (reporters generally use every press release, but they use only one or two items from each). While the Section did not host any "major" press events, it did host a number of smaller events which selected members of the local press were invited to attend (waterfowl stamp art contest, release of "headstarted" Plymouth redbelly turtles, annual sportfishing awards, etc.).

In all, the press outreach generated 3,627 clippings, or an average of 302 per month, many of them substantial, feature length pieces. This is an increase from the 3,299 clippings generated in 1992 (275 per month). This year's total contained 289 clippings that were judged feature stories (placed on the front page of a section or taking up at least

one half of an interior page) for an average of 24 features per month.

In terms of program coverage the Section has clearly succeeded not only in maintaining, but also increasing the level of press coverage achieved last year. Given the relatively stable number of printed media outlets in the state, this may be close to "saturation" coverage.

In addition to issuing releases and responding to requests from members of the media for wildlife related information, the Section encouraged press coverage of wildlife issues as follows:

- Journalists were taken to Ram Island to observe the tern breeding area

Field days / tours were set up for:

- The waterfowl biologist on Canada Geese
- J. Bergin on enhancing streams for trout
- Channel 7 — Moose in the News
- Channel 40 — Focus on Eagles
- Chronicle — Bears
- Norwood H.S. — TV Fishing for Norwood H.S. TV station
- Channel 4 — On the use of Lead Sinkers for Fishing

Numerous items were scheduled for print and electronic media on wildlife in winter.

Interviews on the Division and on Wildlife Management were provided to the *Ladies Home Journal* and to *Women's Day*.

Licenses and Associated Materials

The license coordinator worked closely with contractors to ensure accurate and timely publication of hunting, fishing and trapping licenses, Abstracts of the Fish & Wildlife Laws, Migratory Game Bird Regulations, Archery/Primitive Firearms Stamps, Waterfowl Stamps and Christmas gift envelopes. All materials were delivered by the required delivery date and all were of excellent quality with the exception of the light color of the licenses.

Joining with staff from the Financial Office, the license coordinator conducted several training seminars for new license sales agents to include several K-Mart stores, Sports Authority and a Wal-Mart. This has minimized many time-consuming inquiries from vendors and has emphasized to vendors the Division's commitment to assist them.

Waterfowl Stamp Section clerical staff updated the list of artists who receive information about the DFW's art contests. The Section Chief coordinated publicity and arrangements for the annual waterfowl stamp contest, exhibit and reception held at the Peabody Museum in Salem. Sergio Roffo won top honors with his rendition of a white-winged scoter created by Clarence Bailey.

The **Archery/Primitive Firearms Stamp** competition was held at the Field headquarters in Westboro on May 24. Winning art was a leaping deer painted by Barry Julius of East Bridgewater, MA.

The Chief worked with Marketing contractor Randy Julius of the Studio Down Back, East Bridgewater, to develop a production and marketing plan for the 1994 **Wildlands Stamp**. The art for this year's program was *Whitetail Deer in Fall* by artist Russell Buzzell.

Publications

Section staff worked closely with staff from the Wildlife Section and the Natural Heritage and Endangered Species Program to develop text for a proposed book on Endangered Species for teachers to be published as a joint venture by the Massachusetts Audubon Society. This publication, ***On the Brink*** became available in spring 1994 and has been distributed to Project WILD facilitators.

A major effort was placed on the development and production of **rabies education materials for teachers**. This material was introduced at a workshop for educators sponsored by the Mass. Environmental Education Society.

A project that began last year to update and print a set of **pond maps** for the state, was completed. All six pond map books are now available individually or as complete sets.

Peter Mirick, who serves as the Division's resident herpetologist, coauthored a booklet entitled ***Snakes of Massachusetts*** printed by the Cooperative Extension Service at the University of Massachusetts. He also worked with printers on the production of a **Furbearer poster**.

Few small publications were produced this year although some (trout and pheasant stocking lists, rabies flyers, publications lists) were updated and reprinted. Many publications/flyers in short supply were photocopied from originals to meet public demand. Preparation of the Annual Report for FY 1992 was completed. Preparation of the Annual Report for FY 1993 was initiated.

A series of monthly articles was prepared for the Newsletter of the Worcester County League of Sportsmen's Clubs.

Staff participated in preliminary meetings for the development of a **Watchable Wildlife Guide** for Massachusetts.

Massachusetts Wildlife

Editor Peter Mirick spent most of his time producing four issues of Massachusetts Wildlife. Articles written and edited covered a wide variety of outdoor-related subjects including fisheries, wildlife, management, education, habitat enhancement, ar-

ticles about rare and endangered species and more. Highlight of the year was the production of a special spring issue on nonnative species and their impact on the environment. This issue, *Exotica*, will serve as a reference work for years to come. Also this year the annual deer harvest statistics were published in the magazine for the first time in many years. The editor worked closely with the Senior Photographer who provided custom illustration for all major articles.

The Section Chief worked with representatives of the magazine cooperative and the fulfillment group to develop an annual marketing plan. As part of this process, the Section solicited administrative assistance in obtaining renewed participation from the Registry of Motor Vehicles which had, for a number of years distributed information on the state's outdoor magazine. All components in the magazine's renewal package were revised and reprinted.

Education Programs

Project WILD

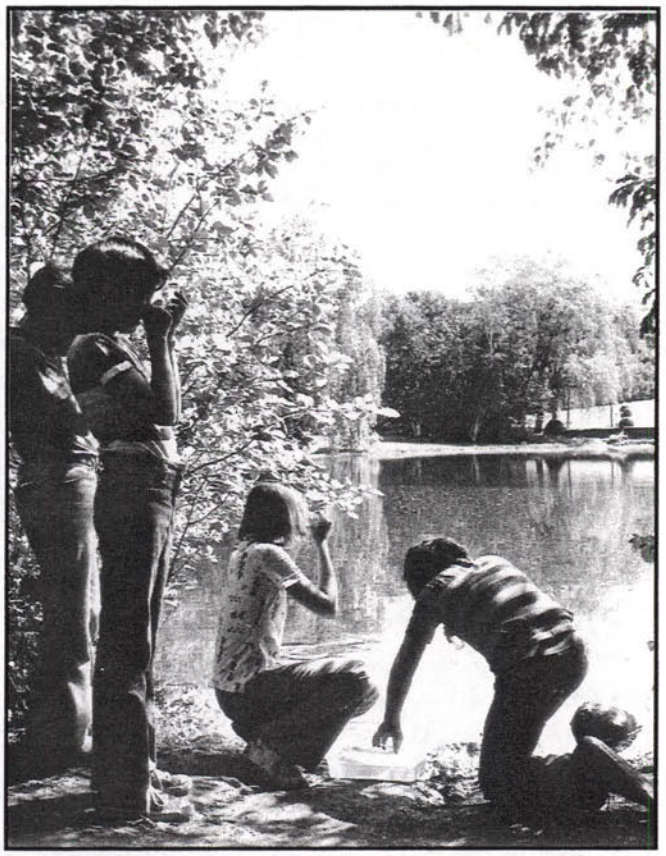
During FY 1994, WILD facilitators held 45 workshops serving a total of 726 participants. Seventeen of these workshops were for Aquatic WILD. Coordinator Marion Larson prepared two newsletters which were mailed to all participants on the Project WILD mailing list. One issue focussed on habitats and a road kill monitoring project, the other issue focussed on neotropical migratory songbirds. The mailing list was pruned of duplication and now reaches 3200 WILD teachers.

Coordinator Larson worked closely with DFW staff and with the education Coordinator of the Massachusetts Audubon Society in the production of *On the Brink*, a teachers' handbook on endangered species. Facilitators also explored opportunities for a WILD segment involving music. This is one of the areas not fully addressed in the existing guides. The annual WILD Facilitators' gathering was held at the New England Science Center, Russ Stanhope, host.

Watershed Education Projects

Four additional schools joined the Merrimack Watershed Education Program bringing the number of schools in Massachusetts participating in this project to 35. Because of staff changes, only 28 of the schools actually participated on the water testing day in October. The student congress was held in March at the University of Mass., Lowell. Approximately 110 students participated. Project Coordinators of Mass. and NH are exploring the possibility of varying themes for future years.

The Blackstone Watershed Education Program held its testing dates both in fall and in spring. For the first time, Rhode Island schools participated.



Watershed Education Program students testing water chemistry.

The Student Congress for this program was held at Clark University, Worcester.

Connecticut River — a group of educators met to explore possibilities for a four-state Watershed Education program on the Connecticut River. The meeting generated much enthusiasm but no plan has been put forth.

Aquatic Resources Education

Volunteers from 12 workshop groups put on 19 basic freshwater fishing workshops for 436 students and 29 special one-day events for an estimated 9,000 participants. Nine workshops were held for instructors bringing an additional 49 instructors into the program.

The Coordinator and Section Chief took time to address issues of policy raised by volunteers. This prompted the coordinator and Chief to provide a detailed review of DFW and AREP operations to program instructors, — something that should be done regularly — for informational purposes.

Massachusetts Junior Conservation Camp

As in the past the Division provided publicity and registration services for the Massachusetts Junior Conservation Camp. Division staff helped to set up numerous programs, provided trout for the pond and stream and taught segments as needed. Among the subjects explored with the campers were camping, aquatic ecosystems, and wildlife management. Section staff also administered and reviewed the

camp examination and participated in the culminating graduation exercises.

The Envirothon

Marion Larson participated in this program in an expanded role, teaching in the first teacher workshop in the fall of 1993. She also worked with an interagency team of educators to develop a teachers' manual which was given out to teachers participating in the Envirothon and served on the program's planning committee. The Section Chief served as a judge.

Lasting Links

In an effort to reach out to teachers in the urban community, the Section took on two teacher interns from south Boston who wanted to learn about wildlife. Their challenge was to become familiar with the Project WILD materials and then, drawing on their individual teaching backgrounds, they helped to produce supplementary materials suitable for use with preschool and special needs students. These materials are now in second draft form and require some further review before being made available to WILD facilitators.

Roadkill Project

As part of the Division's first attempts at electronic outreach, staff provided on-line consultation to teacher Brewster Bartlett and the Roadkill Education Project.

Writers' Groups

The Section Chief participated in the planning and operation of annual conferences of the New England Outdoor Writers Assn. (Worcester, MA Feb. 1994) and the Outdoor Writers Assn. of America (Orono, ME July 1994)

Secretary's Advisory Group on Environmental Education

The Chief is once again on the Steering Committee for this group and is serving a fourth year as Co-Chair of this all-volunteer educators' group. During the year the group conducted a review of the systemic educational reform efforts presently underway in the Commonwealth. As part of their focus for the year, the group has initiated work on environmental literacy, what is it and how can it be measured?

Sportfishing Awards

The program coordinator processed 478 affidavits from anglers who qualified for pins in any one of 20 categories including a new category for broodstock salmon, established last year. Twenty three applications were rejected for failure to comply with the regulations of the program. One application for record status required extensive review and was ultimately disallowed.

Tags 'N' Trout

The annual Tags 'N' Trout Program saw a slight increase in participation over last year, with 29 sponsors pledging prizes in 39 bodies of water statewide. Of the 910 tagged trout stocked, 574 tags were redeemed for prizes, each with a minimum retail value of $20.00, and several worth much more than the minimum. WMRC First-Class Radio in Milford conducted its third annual "First Class Fishing Derby" with hundreds of children participating. The station did a live broadcast during the event and local newspapers and one television news/sports crew covered the one-day derby which launched the TNT Program for that sponsor for the year.

Two other sponsors conducted their second-annual "clean-up" of the areas surrounding the bodies of water they sponsored prior to the stocking of tagged trout, thus emphasizing to children and older participants the importance of never leaving trash behind. At the close of the annual program, 64% of all tags were redeemed for prizes.

Museum

As part of the building renovation process, the Division decided to utilize all available space as office space. This left the McDonough Collection without a home. After extensive meetings with groups in both eastern and western Massachusetts it was determined to relocate the museum to the Commonwealth Museum at Columbia Point, Boston. Once the decision was made, the Section Chief and James Cardoza updated and inventoried the museum's collection and plans were created for a new display center.

Programs

All Section staff provided programs about the DFW and its projects to sportsmen's clubs, garden clubs, school groups, civic groups, church groups and other organizations requesting such programs.

The Section Chief provided a workshop on wildlife education to the Environmental Leadership Seminar at Tufts University, a program entitled "Wildlife in the Suburbs" for the Andover Garden Club and a workshop on "Communications and Conflict Resolution" for ELNA, a student group sponsored by Scientists for Social Responsibility. She also served as a reviewer for a grants program for the Environmental Protection Agency

Visibility

Although there is no official uniform, the Division has moved forward to provide some uniform clothing for staff. This year, for the first time, the Division offered staff a three season field jacket. While these items — shirts, pants, caps and jackets — are not mandatory, they are available to staff in limited quantity and have been well received. The Section has developed a database for keeping track of the clothing components issued to staff.

Information & Education Staff

Ellie Horwitz, *Chief*

Bill Byrne, *Senior Photographer*
Nancy Fulham, *Receptionist/Switchboard*
Jim Lagacy, *Aquatic Resources Education Coordinator* (from 3/94)
Marion Larson, *Education Specialist*
Dan McGuiness, *License Coordinator*
Pat McNamara, *Circulation Manager, Massachusetts Wildlife magazine*
Peter Mirick, *Editor, Massachusetts Wildlife magazine*
Gary Zima, *Aquatic Resources Education Coordinator* (to 3/94)

District Reports

Northeast District, Walter Hoyt, *Manager*
Southeast District, Louis Hambly, *Manager*
Central District, Chris Thurlow, *Manager*
Connecticut Valley District, Ralph Taylor, *Manager*
Western District, Tom Keefe, *Manager*

The five wildlife Districts form the field presence of the Division of Fisheries and Wildlife, administering wildlife lands, conducting on-site management, and dealing with wildlife issues pertinent to their region.

Staff from the districts conduct fisheries and wildlife surveys and help to gather data for research programs. They conduct trout and pheasant release programs and release northern pike and tiger muskies where appropriate. They operate the checking stations where sportsmen register deer, bear, turkeys and furbearers.

They serve as liaison with conservation organizations, including sportsmen's clubs, conduct educational programs within their district, and respond to individual and media inquiries. Another key activity of District personnel is to provide advice and technical assistance to persons and/or other agencies dealing with wildlife problem situations. In this context, District staff deal with a large number of beaver complaints, deer damage complaints and other issues dealing with wildlife impacts on human habitations.

All district personnel distribute licenses, abstracts, stamps and other materials related to the sale of hunting/fishing/trapping licenses. They assist officers from the Division of Law Enforcement to assure public adherence to wildlife laws and regulations, and they assist the staff of the Division's Wildlife Lands Section in locating titles and landowners, and in making arrangements for the Division's acquisition of lands for wildlife.

During the past year District staff once again participated in numerous research programs including the midwinter eagle survey, waterfowl inventory and banding, census of mourning doves, woodcock and quail, and a survey of great blue heron rookeries. They also monitored water quality of lakes and streams prior to releasing fish into them. District staff reviewed the Environmental Monitor for development projects that would affect wetland areas and provided technical advice on the control of environmental problems — particularly in the handling of nuisance animal situations. District managers served as the Division's public relations/education outreach, spending many hours with civic and sportsmen's groups and responding to inquiries from interested citizens.

All Districts offer programs which introduce visitors to the Division and its activities. All participate in the release of specially tagged fish for the Division's Tags 'n' Trout program. All Districts oversee the wildlife management areas in their region. This involves brushcutting, mowing, trimming trails, designing forest cutting operations, planting shrubs and maintaining roads and parking areas. It also involves maintenance of nesting boxes for wood ducks, bluebirds and purple martins and establishment of cooperative agreements with farmers raising crops on DFW lands. Routine maintenance on Division buildings and vehicles is also carried out by District staff.

In addition to the activities that are common to all of the Districts, there are certain projects which require the participation of staff from only certain Districts.

Northeast District

Staff of the Northeast District monitored activities at 9 Wildlife Management Areas, 5 sanctuaries and 7 boat launching ramps. Areas in this District receive particularly heavy public use and the District was called upon to issue 60 camping permits and 450 target range permits during this period. Twenty field trials were held on WMAs in this District. Because the areas is so heavily settled and because of increasing beaver populations, District staff were called on to address 110 problem beaver cases. The growth of this population and the associated increase in complaints, has caused Division staff to look ahead with some trepidation.

This year the District manager represented the Division at some 38 meetings including sessions of conservation commissions, County Leagues of Sportsmen's Clubs, Watershed Associations, town meetings and Goals meetings for Walden Pond and for the Harold Parker State Forest. As in past years, the staff of the Northeast District designed and manned an exhibit at the Topsfield Fair and assisted at exhibits at the New England Sportsmen's Show (Boston) and at the Eastern Fishing Exposition (Worcester).

District staff continued their active participation in the state's Youth Upland Game Hunt and the Youth Upland Waterfowl Hunt. These events are cosponsored by the Essex County League of Sportsmen's Clubs and the U.S. Fish and Wildlife Service (waterfowl hunt only) and are open to interested young sportsmen from any part of the Commonwealth. District staff continued to monitor a special water-

fowl hunting program at the Delaney Wildlife Management site in Boxborough and at the Martin Burns Wildlife Management Area in Newbury.

Southeast District

This year as last year, management in the Southeast District focussed particular attention on two of the larger wildlife management areas (WMAs) the Myles Standish WMA in Plymouth and Crane Wildlife Management Area in Falmouth. On the Myles Standish WMA, 7 acres of field were brushcut to provide control of the woody vegetation, 7 acres of stumps were treated with herbicide, 60 acres of fields were top dressed with fertilizer and lime, 8 miles of trails were mowed and trimmed and a total of 32 bluebird boxes were placed and subsequently checked. On the Crane WMA, 105 acres were brushcut and 62 acres were top-dressed with fertilizer. Eighteen miles of trail were trimmed and mowed; 30 acres of woodland understory were mowed; and 105 acres of stumps were treated with herbicide.

Flashboards at the dam at West Meadows Wildlife Management Area were replaced with pressure treated planks during the drought of the summer/fall of 1993. At the Rochester WMA, the planks at the outlet dam were replaced with pressure treated planks. Planks at three other dams on the Rochester WMA were replaced with untreated planks. By December of 1993 both of these systems were filled with water.

Other management projects included the erection and maintenance of signs and gates and the maintenance of parking areas at nine wildlife management areas.

During the spring, staff maintained 201 wood duck nesting boxes a task which involved checking and cleaning all of the boxes as well as replacing many tops and predators guards. District staff also built and erected 25 new nesting boxes. In addition to the 32 bluebird nesting boxes erected at Myles Standish State Forest, bluebird boxes were erected and checked at ten wood duck areas. Purple martin houses were maintained at five active colonies where birds had nested in Martin houses erected between 1982 and 1984. One loon raft was constructed and placed on Great Quittacus Pond in Rochester and several osprey nests were monitored.

Census counts were conducted for mourning doves, woodcock and bald eagles. One adult and three immature bald eagles were seen at Assawompsett in Lakeville during the midwinter count period.

Managed deer hunts totalling 2,200 man days were conducted at the Otis/Edwards Military Reservation during the archery, shotgun and primitive firearms seasons.

Staff from this district assisted Waterfowl biologist H Heusmann with the spring breeding waterfowl survey, the wood duck hen survey, the summer program of banding and neck collaring of Canada Geese and with subsequent monitoring and counts of birds so marked.

In February, Western District personnel live trapped 11 male and 15 female turkeys in Berkshire County. These birds were subsequently released near the Peterson Swamp Wildlife Management Area. Numerous turkey sightings have been reported throughout the District — some of them more than 10 miles from the release site.

Fisheries staff assisted staff of the Sandwich Fish Hatchery in reconstruction of the Hatchery and in computer operations as requested. Fisheries staff participated in the development of a statewide trout management plan and the Fisheries Manager of this District served on the Trout Technical Committee.

During the summer, operations focussed on assessing profiles of 15 actual or potential trout ponds to determine the amount of available trout habitat. Lake surveys were conducted on Grews Pond in Falmouth, Cleveland Pond in Abington and Sandy Pond in Westport. More than 17 streams were sampled to provide fisheries information for use in Environmental Reviews or for management purposes. Stream surveys concentrated on the Palmer and South Coastal drainages. Several populations of native brook trout were documented as were holdover populations of stocked, catchable brown trout and brown trout fingerlings. As in previous years, inventory was conducted on populations of sea-run trout in the Quashnet and Mashpee Rivers.

A winter ice fishing creel survey was conducted on Agawam Mill Pond and Glen Charlie Pond in Wareham. These ponds were also electrofished in May 1994 to sample their bass populations.

Technical guidance was provided to local and state agencies, private consulting firms and individuals on matters dealing with the fisheries resources. Fisheries personnel assisted in the Ashumet/Johns Ponds taskforce which is part of the Mass. Military Reservation Cleanup. The staff also assisted Woods Hole Oceanographic Institution's biomonitoring study, Mass. Cooperative Fisheries Unit's herring study and the Cape Cod Mosquito Control District's study using fish as mosquito control agents.

In July of 1993, fishkills due to natural causes were investigated at East Monponsett Lake in Halifax and at Sylvia's Place Pond in Kingston. A fishkill in June 1994 on South Meadow Brook in Carver proved to be caused by low dissolved oxygen content

Central District

Central District Fisheries staff of this District surveyed 9 streams and 6 ponds. Age and growth analysis, food habits and spawning success studies were carried out on Landlocked Salmon and Lake Trout at Wachusett Reservoir. Northern Pike were sampled for growth rate at Webster Lake, Lake Quinsigamond and East Brimfield Reservoir. Winter creel census was carried out at Webster Lake. Bass populations were analyzed at Lake Quinsigamond, Webster Lake, South Pond and Wachusett Reservoir. District staff assisted in studies of Lake Trout and Salmon at Quabbin Reservoir.

Maintenance efforts, including brushcutting, general maintenance and installation of gates, were carried out on 13 wildlife management areas. Boundary markers and other informational signs were posted on all Wildlife Management Areas as needed. New signs and gates were installed on new Wildlife Management Areas and boundary markers were installed at Thayer Pond WMA, Miller River WMA and Leadmine WMA.

The District Manager attended meetings of the Worcester Co. League of Sportsmen's Clubs and attended a variety of meetings with local and state agencies on such issues as highway construction, wetlands permits and other wildlife and environmental issues. Informational programs were presented to civic and sportsmen's groups and technical assistance was provided as needed. Sixty-six beaver complaints were investigated and appropriate actions were taken. The moose response team responded to calls regarding six problem moose.

Connecticut Valley District

In addition to the activities in which all Districts participated, the staff of the Connecticut Valley District conducted programs specific to the Valley. District fisheries staff stocked over 140,000 trout in spring and an additional 16,400 trout in fall. Staff also released 17,000 landlocked salmon into Quabbin Reservoir and tiger muskies in various waters throughout the District.

District staff conducted a special waterfowl hunt at the Ludlow Wildlife Management Area. This included erecting hunting blinds, preparing access and administering the hunt through a permit system. Staff also worked to initiate handicapped fishing access on the property with the Westover Advisory Commission. In addition to the regular activities on management areas, District staff reclaimed several fields on the Poland Brook and Swift River WMA's. The District also provided field support for several research projects. These included climbing to eagle nests to secure juvenile eagles for physical examinations, attending an AMC workshop on rock climbing and rappelling techniques, conducting deer yard surveys, conducting goose banding and collaring

Massachusetts Junior Conservation Camp.

drives, monitoring population trends in smallmouth bass and conducting stream surveys of Quabbin tributaries for evidence of salmon reproduction.

Staff from this District again played an active role in operations of the Mass. Junior Conservation Camp by providing instructors for two sessions, one on fisheries biology and management and the other on wildlife management techniques.

The District Manager spoke on wildlife management issues at the University of Massachusetts and at Holyoke Community College. The Fisheries Manager conducted several Aquatic Resources Management workshops and the Wildlife Manager conducted a series of Black Bear workshops at local elementary and secondary schools in the area.

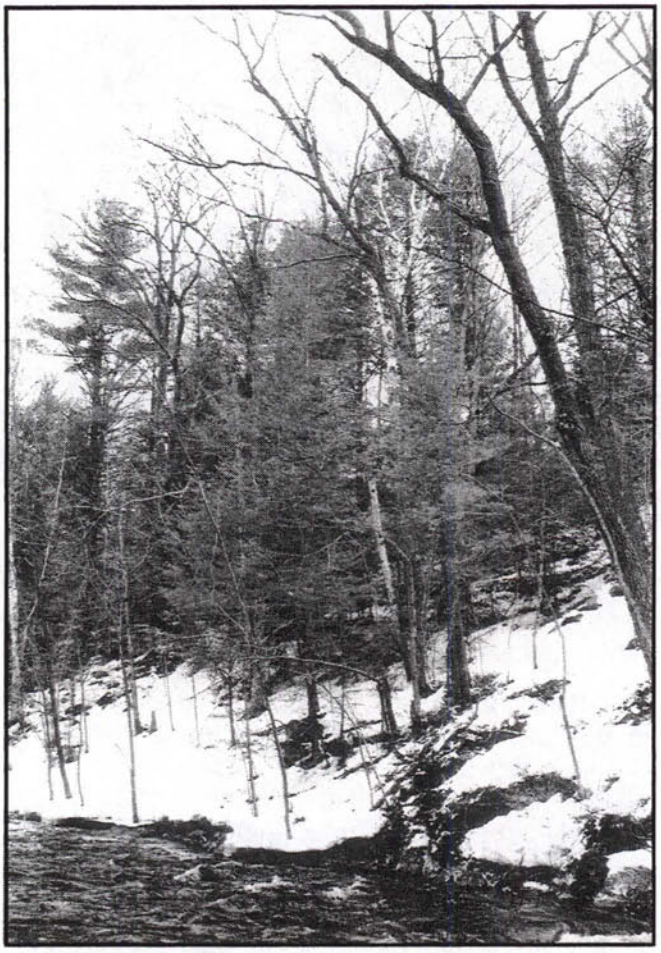
Western Wildlife District

Staff from the Western Wildlife District continued their active involvement with ongoing programs including operation of check stations, release of trout and pheasants, provision of technical assistance.

District Fisheries staff conducted fisheries surveys on 22 streams and two ponds. They also investigated a number of fishkills. They monitored water temperatures and water chemistries on several District streams to establish baseline data for stream management programs. They also conducted a bass pond creel census.

Maintenance of wildlife management areas occurred in summer and fall months with activities such as erection of signs and vegetation control on 83 acres. Nineteen cooperative farming agreements were overseen and 29 miles of boundary lines were established and maintained.

District staff assisted in the assessment and evaluation of wildlife and ecological impacts relative to a major wetland violation resulting from the breaching of a beaver dam in the town of Lenox. District staff



along with biologists from Field Headquarters assisted the Attorney General' Office and the Dept. of Environmental Protection in pursuit and remediation of this issue.

District wildlife staff located and captured 34 wild turkeys subsequently released in the Southeast District. They also maintained 189 wood duck nesting boxes and erected 22 new ones. They built and erected 11 bluebird boxes, participated in surveys of eagles, woodcock, mourning doves, park ducks and mallard-black duck surveys. Staff participated in wood duck studies, the goose collaring program, a survey of deer wintering areas and in the nesting passarine bird census on the Hy Fox WMA. As in other Districts, staff responded to a wide variety of nuisance animal complaints including, particularly, complaints about the activities of beaver (140), requests to install or remove beaver pipes, complaints about moose, and black bear (47). Technical assistance was provided to municipal, county, state and federal agencies as well as to lake associations, the Tenneco Co. and a variety of advisory groups. Staff from this District also played a key role in the management and operation of the special deer hunt for paraplegic sportsmen.

District fisheries staff conducted fish surveys on 15 streams and two public ponds and investigated three fishkills. They monitored water chemistries to establish data needed for stream management, handled inquiries from the public and provided technical assistance to town conservation commissions, and to county, state and federal agencies involved with the permitting of various construction or development proposals.

District Personnel

Northeast District:

Walter Hoyt, *Manager*
Al Ortiz, *Game Manager* (up to 8/14/93)
Erik Amati, *Game Manager* (as of 1/30/93)
Peter Jackson, *Fisheries Manager*

Dave Ford
Bob DesRosier
Butch Cannata
Lawrence Howie
Frank O'Meara
Sue Ostertag

Southeast District:

Louis S. Hambly, Jr., *Manager*
Richard Turner, *Game Manager*
Steve Hurley, *Fisheries Manager*

Ed Kraus
Camie Marsh
Richard Norton
Salvatore Paterno
Kenneth Weaver

Central District:

Chris Thurlow, *Manager*
Dave Fuller, *Game Manager*
Lee McLaughlin, *Fisheries Manager*
Dave Carlson, *Birch Hill WMA Supervisor*

Paul Le Boeuf
Priscilla MacAdams
Arthur Myers
Paul Orrizzi

Connecticut Valley District:

Ralph Taylor, *Manager*
Michael Ciborowski, *Game Manager*
David Basler, *Fisheries Manager*

Barbara Bourque
Gary Galas
John Nowakowski, Jr.
Tom Valley
James Wright

Western District:

Tom Keefe, *Manager*
Anthony Gola, *Game Manager*
Leo Daly, *Fisheries Manager*

Dale Beals
Elna Castonguay
Joseph Kirvin
David St. James
Jerry Shampang

Realty

William Minior
Chief, Wildlife Lands

Fifty nine (59) acquisitions were recorded in the thirteen month period from July 1, 1993 through July 1994. July 1994 recordings have been included as they represent FY 94 expenditures, but primarily in an effort to bring the annual Land Inventory in line with the present EOEA policy regarding acquisitions/recordings. Future annual land inventory reports will be based upon annual expenditures which will correspond better with actual recordings. This change from the traditional land inventory (which dates back to 1967) based strictly upon recording dates is necessary to coordinate land acquisition programs and facilitate data tracking.

The Fisheries and Wildlife Lands Committee was established in FY 94 in an effort to identify and target valuable resource areas and to insure that the biological and district perspectives are included in the discussion and prioritization of all DFW/DFWELE land acquisitions. The first Committee meeting was held in January, or halfway through the fiscal year, which severely limited processing time for new acquisitions. Only twenty three acquisitions were completed with FY 94 funds but they represented approximately nine million dollars. The remainder of the parcels recorded in FY 94 represent previous year expenditures which could not be completed for various reasons, primarily title related.

Three particularly notable acquisitions were included in this period. The 1,147 acre Facing Rock WMA acquisition in the Town of Ludlow is a tremendous resource within a few miles of the City of Springfield and it greatly increases DFW holdings in Hampden County. The Jug End in Egremont was acquired jointly with DEM with a great deal of assistance from The Nature Conservancy. This 1,158 acre tract lies within the Karner Brook ACEC, contains rare and endangered species, a variety of habitat types and significant passive recreational potential. Independence Park in the Town of Barnstable represented the NHESP's highest priority and it was acquired through an eminent domain taking. In addition to rare and endangered species protection, this tract provides substantial watershed protection and wildlife habitat protection.

Many other valuable acquisitions were completed statewide, including additions to many existing DFW areas and many new areas. The DFW presently owns nearly 78,000 acres of valuable habitat throughout the Commonwealth. Over 8,000 acres were recorded in the period covered by this report.

Western District

Thirteen acquisitions totalling 3,323 acres and comprising nine different areas led the district land protection efforts. Major additions to Fox Den, Chalet, Stafford Hill, Savoy and Hiram H. Fox WMAs were accomplished as was a large addition to the Maple Hill Heritage area. Three large new areas represent outstanding resources. Three Mile Pond in Sheffield, a former target of DFW, contains 590 acres of wetland and upland habitat, including an excellent warmwater fishery. It is a good waterfowl and fur bearer area and is aesthetically outstanding. The Jug End was acquired jointly with DEM and TNC assistance and will be managed primarily for passive recreational use. It lies within the Karner Brook ACEC, contains rare and endangered species, a variety of high quality habitat and extensive recreational opportunity. The 550 acre Walnut Hill WMA in Middlefield connects with other DFW holdings along the Westfield River forming a multi-use resource area.

Connecticut Valley District

Several new areas including Facing Rock, Palmer, Lake Warner and Whately WMAs, the Green River and the Sunderland Islands were added in FY 94. Facing Rock WMA represents a 1,147 acre woodland tract in the Town of Ludlow within ten miles of the City of Springfield. It is excellent upland habitat and provides extensive watershed protection. The Franklin Land Trust pre-acquired the 243 acre Whately WMA which consists of mixed age woodland, fields and limited wetlands. It is excellent bear habitat as well as good habitat for a variety of other species. Substantial additions to Satan's Kingdom, Montague, Wendell and the Millers River were also completed.

Central District

Seven areas were augmented and a new resource, McKinstry Brook, in the Towns of Southbridge and Sturbridge was acquired. It consists of 226 acres of mixed age habitat, fields and extensive frontage on a coldwater stream. Access was provided to Lackey Pond in the Town of Sutton and major additions to the Millers River, Quaboag, Phillipston, Popple Camp, Prince River and Merrill Pond WMAs were recorded. Twelve hundred and twenty seven acres were brought under DFW control bringing the total Central District holdings to approximately 24,380 acres.

Northeast District

Ten acquisitions representing approximately 500 acres were added to existing holdings in FY 94. Two new areas, Hunting Hills in Townsend and Boxboro Station, a watchable wildlife area, were also acquired. Sixty one acres were added to the Squannacook River WMA, twenty acres were added

to the Nissitissit River and another eighteen acres to the Nashua River. The Trapfall Brook area doubled in size and substantial additions were made to the William Forward and Ashby WMAs. The 73 acre Rowley acquisition contained over one mile of Mill River frontage with an interesting mix of marshland and upland. It is a valuable addition to our William Forward WMA.

Southeast District

Five new areas were included in the districts ten acquisitions. Although all acquisitions are important, two of extreme value are of special interest. The South Barrier Beach acquisition on Edgartown consists of nearly one hundred acres and contains about one mile of barrier beach. It provides excellent coastal shore fishing and birding opportunity. The Hyannis Ponds acquisition in Barnstable is the most expensive single acquisition undertaken by our agency to date. It has always been the NHESP's highest priority and it consists of a complex of sand plain community ponds and their associated rare and endangered species. It also provides important watershed protection to abutting municipal wells. Three "fingers" were added to the Frances Crane WMA, a 28 acre inholding was secured in the Rocky Gutter WMA, and important rare and endangered species acquisitions were completed in Brewster, Nantucket, Mashpee and Wellfleet. Approximately 640 acres or one square mile of land was protected in FY 94.

Funds expended during this period were as follows:

Western District
Expended $2,629,860.00
Acreage 3,322.5
Cost/acre $791.53

Valley District
Expended $2,028,172.50
Acreage 2,342.78
Cost/acre $865.71

Central Distirct
Expended $1,161,112.00
Acreage 1,227.14
Cost/acre $946.19

Northeast District
Expended $1,476,400.00
Acreage 486.5
Cost/acre $3,034.74

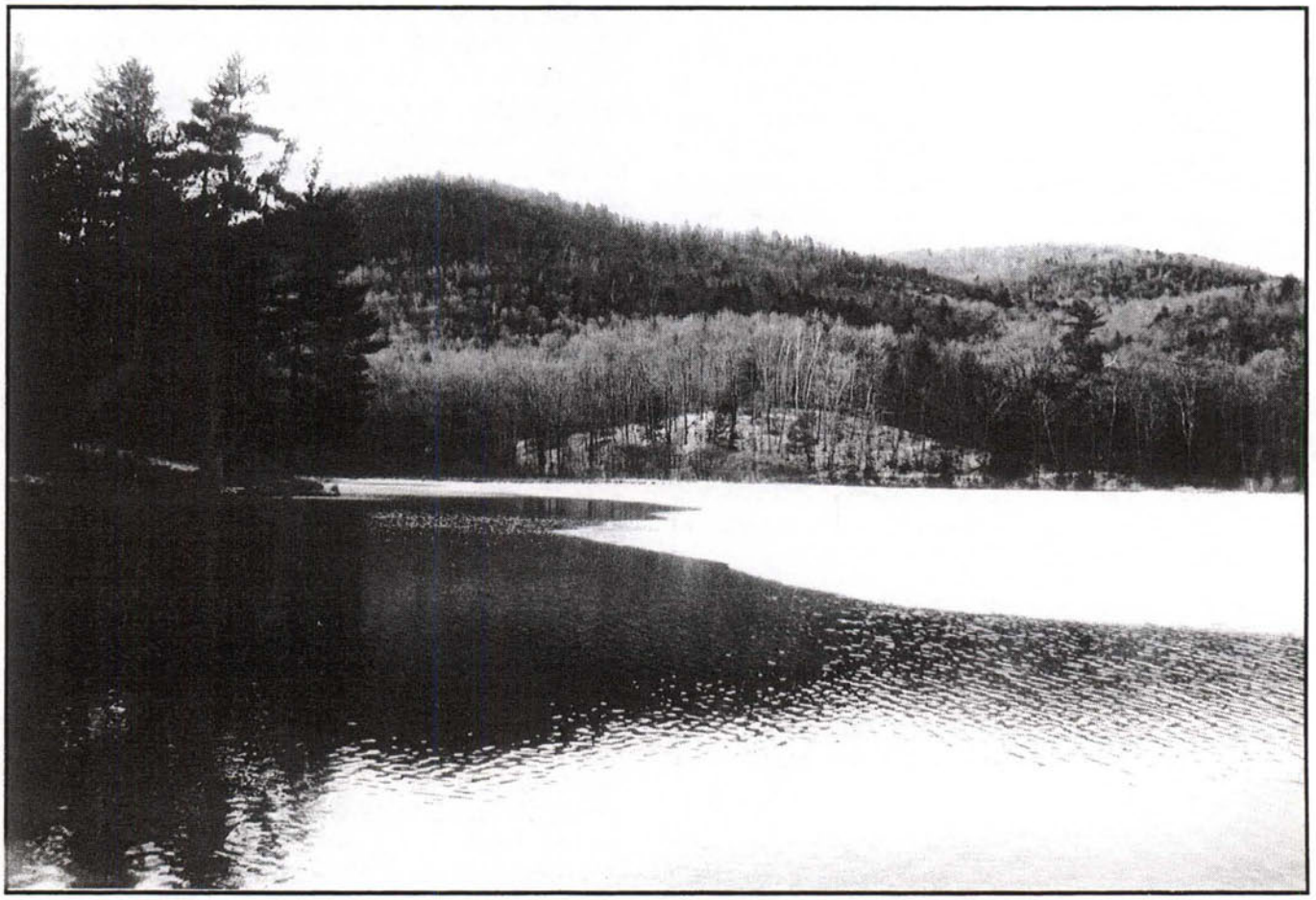
Southeast District
Expended $6,946,500.00
Acreage 638.38
Cost/acre $10,881.45

TOTAL Expended: $14,242,044.50

TOTAL Acreage Acquired: 8,017.30

AVERAGE COST Per Acre: $1,776.41

Above figures include departmental acquisitions. It should be noted that the acreages and costs of those properties RECORDED in FY 94 ***and*** *FY 94 acquisitions recorded in FY 95 are utilized herein.*



Total of Division Managed Lands

Western District

Wildlife Management Areas - 19	Acres	Tract #
Becket	234.0	60
Chalet	1,826.5	86
Eugene Moran	1,147.0	91
Fisk Meadows	429.17	88
Fox Den	2,176.9	100
Hancock	204.0	123
Hinsdale Flats	1,454.25	89
Hiram H. Fox (formerly Canada Hill)	2,653.0	48
Hop Brook	415.1	112
Housatonic Valley	817.9	67
John J. Kelly	267.0	85
Jug End*	1,157.8	191
Otis	83.5	124
Peru (Inc. Tracy Pd.)	3,551.5	30 & 113
Powell Brook	196.0	115
Savoy	1,282.8	64
Stafford Hill	1,481.0	56
Three Mile Pond	590.0	181
Walnut Hill	550.0	190
Subtotal:	20,517.42 acres	

**Jointly owned and managed with DEM*

River Access Areas - 4		
Green River(W)	117.78	125
Housatonic River	27.5	103
Konkopot River	8.8	114
Westfield River (W)	373.0	94
Subtotal:	527.08 acres	

Wildlife Sanctuaries - 2		
E. Howe Forbush	268.0	16
Grace A. Robson	69.5	24
Subtotal:	337.5 acres	

Wildlife District - 1		
District Headquarters	2.1 acres	13

Nongame Areas - 4		
Nordeen Marsh	22.9	102
Jug End Fen	38.8	147
Maple Hill	202.0	148
Kampoosa Fen	72.0	173
Subtotal:	335.7	

Forest - 1		
Windsor	110.0	116

TOTAL Western District 21,829.80 acres

Connecticut Valley District

Wildlife Management Areas - 17	Acres	Tract #
Catamount	256.0	119
Facing Rock	1,146.5	179
Lake Warner	94.8	180
Leadmine(V)	344.0	170
Millers River(V)	65.84	A62
Montague	1,338.59	118
Palmer	250.0	178
Pauchaug Brook**	161.3	74
Poland Brook	618.73	70
Satan's Kingdom***	1,305.4	107
Swift River*	1,474.14	49
Wales	207.15	172
Warwick	112.0	126
Wendell	575.2	144
Westfield	182.0	174
Whately	243.0	182
Williamsburg	88.0	127
Subtotal:	8,462.65 acres	

**Combination-Hatchery(McLaughlin), WMW and District Hdqtrs.*
***WMA and Connecticut River Access*
****Acreage includes 124 acre CR*

Islands (Connecticut River) - 2		
Shepherd's Island	15.0	80
Sunderland Islands(2)	9.0	189
Subtotal:	24.0	

Fish Hatcheries - 4		
Bitzer	150.6	7
McLaughlin(inc. in Swift R.WMA)		
Reed	301.0	8
Sunderland	47.7	9
Subtotal:	499.3	

Game Farm - 1		
Wilbraham	144.0	4

River Access - 7		
Connecticut River	70.8	117
Green River(V)	29.5	185
Sawmill River	51.0	176
Sibley Brook	13.39	152
Tully Brook	77.0	177
Ware River(V)	14.0	A63
Westfield River(V)	63.8	111
Subtotal:	319.49 acres	

Pond Access - 2		
Little Alum Pond	0.5	128
Lake Lorraine (PAB)	0.26	129
Subtotal:	0.76 acres	

Nongame Areas - 4		
Rainbow Beach	30.9	142
Mt. Toby High;ands NHA	100.0	159
Darwin Scott Memorial	27.3	157
Honey Pot NHA	10.18	175
Subtotal:	168.38	

TOTAL Conn. Valley District 9,618.58 acres

Central District

Wildlife Management Areas - 30	Acres	Tract #
Bennett	281.2	A77
Birch Hill	3,210.2	50
Bolton Flats	922.7	90
Breakneck Brook	707.0	158
E. Kent Swift	257.0	84
Fish Brook	110.0	130
Four Chimneys	200.0	77
High Ridge*	2,018.2	98
Lackey Pond	150.54	165

Lawrence Brook	357.0	108
Leadmine(C)	296.0	170
McKinstry Brook	226.3	184
Merrill Pond (System)	336.4	10
Millers River(C)**	2,516.92	62
Moose Hill	567.1	59
Muddy Brook	647.6	167
Oakham	310.0	153
Phillipston	3,266.3	31
Popple Camp	1,160.98	A31
Poutwater Pond(fmly North Street)	378.0	133
Prince River	690.06	113
Quaboag River	1,445.4	55
Quacumquasit	170.0	131
Raccoon Hill	416.0	151
Richardson	349.68	106
Savage Hill	452.4	150
Thayer Pond	131.0	171
Ware River(C)	246.0	63
Westboro	427.6	35
Winimusett	515.0	61
Subtotal:	22,762.60 acres	
**Management and control under DFW*	*1,673.7 ac*	
DFW owned in fee	*282.0 ac*	
***Acreage includes 15.72 acre CR*		
Wildlife Sanctuaries - 2		
Susan B. Minns	140.0	20
Watatic Mountain	139.0	25
Subtotal:	279.0	
River Access Areas - 4		
Five Mile River	150.0	120
Moose Brook	430.31	132
Quinapoxet River	32.0	66
West & Blackstone Rivers	28.0	76
Subtotal:	640.31	
Nongame Area - 2		
Podunk Marsh	15.0	104
Clinton Bluff NHA	42.0	154
Subtotal:	57.0	
Conservation Restriction - 4		
Carter Pond	280.0	155
Burnshirt River	5.64	160
Quabbin	28.0	161
Stillwater River	29.0	162
Subtotal:	342.64	
Marshes - 1		
Quinsigamond Marsh	59.0	156
Pond Access - 4		
Cusky Pond	23.75	163
Fisherville Pond	1.6	166
Glen Echo Lake	1.0	149
Sputtermill Pond Area	58.5	164
Subtotal:	84.85	
Forest - 2		
Hamilton	70.0	75
Northboro	88.8	51
Subtotal:	158.8	
TOTAL Central District	**24,384.2 acres**	

Northeast District

Wildlife Management Areas - 8	**Acres**	**Tract #**
Ashby	540.1	134
Crane Pond	2,122.6	38
Hunting Hills	188.0	183
Martin H. Burns	1,554.5	37
Nissitissit River	339.0	71
Pantry Brook	410.9	29
Squannacook River*	894.9	53
William Forward	1,780.5	36 & 82
Subtotal:	7,830.5	
Wildlife Sanctuaries - 5		
Carr Island	110.5	18
Egg Rock	2.0	17
J.C. Phillips	391.0	15
Milk Island	29.0	19
Ram Island	20.0	23
Subtotal:	552.5	
Game Farm - 1		
Ayer	96.9	1
Wildlife District - 1		
District Headquarters	1.9	11
Pond System - 1		
Flint Pond	81.9	28
Forest - 1		
Townsend	60.0	33
Pond Access - 4		
Knops Pond	0.6	52
Mascopic Lake	0.3	65
Baddacook Pond	0.16	A52
Long Sought For Pond	1.0	143
Subtotal:	2.06	
**21 acres title vested in DEM*		
Salt Marsh - 1		
North Shore	335.65	47 & 58
Stream Access - 5		
Concord River	4.7	97
Nashua River	48.5	110
Trapfall Brook	45.4	109
Sudbury River*	139.06	121
Weymouth Back River**	16.43	135
Subtotal:	254.09	
Nongame - 2		
Boxboro Station	25.4	188
Elbow Meadow	132.8	101
Subtotal:	158.2	
TOTAL Northeast District	**9,373.4 acres**	
**Held jointly with D.E.M.*		
***Departmental acquisition*		

Southeast District

Wildlife Management Areas - 10	**Acres**	**Tract #**
Acushnet	355.8	141
Erwin Wilder	450.0	A83
Frances A. Crane	1,743.01	27
Gosnold	3.5	96

Hockomock Swamp	4,389.2	83
Hyannis Ponds *	357.0	187
Peterson Swamp	250.0	81
Rochester	70.0	57
Rocky Gutter	3,004.6	68
West Meadows	221.9	34
Subtotal:	10,845.0	
Wildlife Sanctuaries - 4		
Billingsgate Island	0.5	14
Penikese Island	60.0	21
Ram Island	2.0	22
Tarpaulin Cove	4.5	93
Subtotal:	67.0	
Wildlife District - 1		
District Headquarters	23.8	12
Fish Hatcheries - 1		
Sandwich	60.0	5
Game Farm - 1		
Sandwich	133.0	3
Salt Marsh - 4		
Brayton Point	2.2	169
English	68.0	146
Fox Island	71.1	192
South Shore	22.4	69
Subtotal:	163.7	
Stream Access - 4		
Childs River	0.25	193
Mashpee River	56.47	78
Nemasket River	0.46	122
Quashnet River**	411.9	32
Subtotal:	469.08	

** NHESP priority area-Departmental taking*
*** 360 acres of Quashnet held jointly with DEM*

Pond Access - 5		
Bakers Pond	1.7	79
Bearse Pond	5.8	72
Clapps Pond	68.4	87
Cooks Pond	3.0	73
Lake Snipatuit	0.5	92
Sandy Point	0.2	54
Subtotal:	79.6	
Military Lands - 7		
Dillingham Lot	37.0	45
Fisk Forestdale Lot	117.0	46
Hog Pond Lot	26.2	42
Lawrence Pond Lot	10.0	43
Mashpee Pond Lot	25.0	40
Poponesset Beach	2.0	41
Springhill Lot	7.0	44
Subtotal:	224.2	
Hatcheries - 1		
No. Attleboro Hatchery	36.46	99
Marsh Management - 1		
Eastham Area	7.44	136
Fisheries and Wildlife Area - 2		
Muddy Pond	72.0	95
SouthBarrier Beach (Leland)*	99.5	194
Subtotal:	171.5	
Nongame Areas - 9		
Grassy Pond	25.5	168
Harlow Pond	29.35	145
Head of the Plains	2.0	138
Katama Plains*	18.52	140
Mashpee Pine Barrens	98.9	105
Miscomet Heath	3.83	186
Olivers Pond	12.0	139
Sly Pond	192.0	137
Thad Ellis	1.5	137
Subtotal:	388.6	

TOTAL Southeast District 12,669.38 acres
** Departmental Taking*

Total Acreage by Management Type

(Through FY 94)

Wildlife Management Areas - 84	70,418.7 acres
Wildlife Sanctuaries - 13	1,236.0
Fish Hatcheries - 5	559.3
Game Farms - 3	373.9
Streambank - 24	2,210.05
Salt Marsh - 5	499.35
Lake & Pond Access - 16	167.27
Fisheries & Wildlife Areas - 2	171.5
NHESP Areas - 21	1,107.88
Conservation Restriction - 4	342.64
**Some CR's are noted in district tallies*	
Other* - 20	789.6
GRAND TOTAL	**77,867.19 acres**

****Includes:** Pond Systems, Military Lands, Forest Areas, Wildlife Districts, Islands, Hatchery Land, MDC/F&W Areas and Marsh Management Areas.*

Federal Aid Program

R. Stewart McCaig
Administrator, Federal Aid Program

Pittman-Robertson funds available to Massachusetts beginning in October, 1993 were the highest ever apportioned to this state and totaled $1,845,116 for assistance in wildlife restoration and hunter education during federal fiscal year 1994. Most of these funds found application in projects to restore and manage black bear, whitetail deer, wild turkeys, important furbearers, and some game bird species. An unusual item included this spring was the decennial coastal colonial waterbird inventory. Some of the federal funding will assist with recently organized efforts to deal with itinerant moose that migrate from northern states and with efforts to cope with the rabies epizootic spreading throughout Massachusetts. As always, a part of the apportionment was allocated through a DFW budget item to DELE for training hunters in the safe use of hunting tools, and in the ethics of sportsmanship.

In 1984, the Wallop-Breaux amendment substantially changed original Dingell-Johnson legislation for the restoration of sport fisheries. Beginning in 1986, revenues collected from additional sources of taxation began to provide several times as much federal funding assistance as had previously been available for sport fisheries. The law included however, provisions for sharing federal apportionments between fresh-water and salt-water fisheries. (Note: The original Dingell-Johnson bill was apportioned partially on the basis of fishing license numbers and therefore did not directly cover marine fisheries that are unlicensed in many states. However, there has always been an indirect coverage of marine fisheries through inclusion in the area of coastal states of offshore national coastal waters in the second part of the apportionment formula.) In accordance with a Memorandum of Understanding signed by their administrators in November, 1990, DFW and DMF divide the Wallop - Breaux Act apportionments equally. In the original bill, Wallop - Breaux required that 10% of state apportionments must be used for recreational boating access; beginning in 1993, the mandated percentage was increased, and at present both agencies must devote 12.5% of their federal funds to boat access. Not all revenues that enter the federal Sport Fish Restoration Account are available for fisheries management. Recent legislation mandates allotments from the Account for restoration of coastal wetlands and also for development of shoreline "pump-out" stations that will be equipped with facilities to dispose of sewage from vessels.

The 1994 W-B apportionment totaled $1,746,287, of which $218,286 was directed to access. The 1994 total figure compares approximately with the average for the previous three years after adjustment for an erroneous Treasury Dept. overcredit of tax revenues in 1993 and the subsequent "payback" in 1994.

Federal funds assisted with University of Massachusetts contract work on Connecticut river fisheries, aquatic resources education, investigations of bass fisheries, release and evaluation of large esocids, and production of trout at five state hatcheries. Relatively minor amounts supported federal aid coordination and improvements to the Field Headquarters and wildlife district offices. To date the Division has used mandated access funds to undertake a total of seven major coastal access projects, ranging between Swansea, near the Rhode Island boundary, and Salisbury, a town close to New Hampshire, and one inland, in Brookfield.

Among the Coordinator's other duties were responses to questionnaires, pursuance of handicapped access responsibilities, federal personal property inventory, overview of project performance and financial reporting, and liaison with the federal grantor office, in Hadley. He responded to a recent communication that solicited state input to deal with anticipated higher program costs amounting to as much as 1.31 percent by the year 2003. In November, the USFWS, in compliance with the National Environmental Policy Act (NEPA), initiated a Supplemental Programmatic Environmental Impact Statement, and the Coordinator assisted DFW administrators with their interpretation, selection, and comment regarding several alternatives offered by the grantor agency on the terms of this instrument. He continued to conduct liaison with the regional federal office in Hadley attending federal workshops and the annual conference held for coordinators of thirteen northeast regional states and the District of Columbia.

Maintenance and Development

Stephen Henry
Senior Planner

The Division continues to place a high priority on maintaining and upgrading its facilities. The following highlight those efforts:

The vinyl flooring in two offices at **Northeast Wildlife District** has been replaced. Also, a new furnace has been installed replacing the 25+ year old furnace at that location. The driveway in front of the three bay garage at the District office was paved. Fencing and gates have been installed on the dam at Pantry Brook Wildlife Management Area for safety and security reasons. The furnace at the **Martin Burns WMA** office was also replaced.

The **Connecticut Valley District** acquired and installed six steel gates to secure access at several wildlife management areas. Several air conditioners were purchased for the District offices making them much more comfortable during the hot summer months. Also, carpeting was replaced in four offices.

In a continuing effort to upgrading its District Headquarters facilities, the **Southeast Wildlife District** replaced the vinyl tile flooring in several offices. The District headquarters became handicapped-accessible with the installation of a ramp system and new door hardware. Bulk lime and fertilizer were acquired and spread at the Crane and Myles Standish Wildlife Management Areas.

The **Western Wildlife District** had a new phone system installed. Also, the District Headquarters became handicapped-accessible with the installation of a ramp system and door hardware. The roadway and parking area at the Hiram Fox Wildlife Management Area was regraded with 40-tons of processed gravel.

Several electric overhead door openers were installed in vehicle storage garage at the **Central Wildlife District.** District personnel continued to perform management area maintenance throughout the District.

New offices were constructed in anticipation of moving the Natural Heritage and Endangered Species staff from Boston to the **Westboro Field Headquarters**. The entire ground floor of was gutted and office space to house the more than 15 staff members was constructed. Additionally, storage space, a small meeting area and a G.I.S. facility were built. The small museum that has been housed at the Field Headquarters for the past twenty-five years has been moved to Boston. The now vacant museum space has been converted into two offices allowing for the centralization of the Division's Information and Education Section.

Hatcheries

Following up last year's construction and development of a gravel packed well at **McLaughlin State Fish Hatchery**, pre-construction design plans have been developed incorporating this new water supply into the existing water distribution system. These pre-construction engineering plans include backup power, plumbing, material specifications and estimated project costs. Several large white pine trees that were leaning over the hatch house were removed at **Palmer State Hatchery.** Also, personnel disposed of a 30-gallon drum of sodium arsenate. **Montague Hatchery** personnel replaced several dam boards.

State Capital Outlay funds have been used to construct significant improvements at the **Sandwich Hatchery.** Contractors installed two well pumps, constructed a pump house that houses a pump, backup generator system and a state of the art electrical transfer system. This electrical transfer system detects power interruptions and turns on the backup generator transferring power to all pumps and feed storage facilities. Installation of water lines from the two wells to the top of the raceway system allow hatchery personnel primary and secondary water sources to all parts of the hatchery.

Legislative Report

Jack Buckley
Deputy Director

Chapter 182 AN ACT FURTHER REGULATING CIVIL INFRACTIONS October 14, 1993

This legislation contains provisions which raise criminal poaching fines, increases the amounts paid in restitution for animals taken illegally, and redefines the environmental police officers' seizure authority for violations of inland fish and game laws.

Chapter 217 AN ACT RELATIVE TO ARCHERY November 4, 1993

Amends Sections 64 and 69 of Chapter 131 to allow the Fisheries and Wildlife Board to establish rules and regulations on the type of bow and arrow used in archery hunting

Chapter 495 AN ACT MAKING APPROPRIATIONS FOR THE FISCAL YEAR ENDING JUNE THIRTIETH, NINETEEN HUNDRED AND NINETY-FOUR TO PROVIDE FOR SUPPLEMENTING CERTAIN EXISTING APPROPRIATIONS AND FOR CERTAIN OTHER ACTIVITIES AND PROJECTS January 4, 1994

Section 33. Inserts a new section 2B in Chapter 131 that directs the State Treasurer to deposit all revenues to the Inland Fish and Game Fund in a manner that will ensure the highest rate of interest, and all interest accrued shall be deposited into the Inland Fish and Game Fund.

Section 34. Amends section 11 of Chapter 131 by providing the authority to the Fisheries and Wildlife Board to establish classes of sporting, hunting, fishing, and trapping licenses.

Personal Transactions

FY 94

New Hires

Nancy Fulham	Clerk III	Westboro	12/19/93
Erik Amati	Game Biologist	NorthEast	01/30/94
Hanni Dinkeloo	Conserv. Bio. II	Boston	05/22/94

Seasonals

Jay Willets	10/12/93	Ayer Game
Jon Sojka	04/10/94	Sunderland
Scott Ewell	04/17/94	Bitzer
John Sheppard	04/24/94	Westboro
Jason Goldstein	05/11/94	Westboro
Robert Bright	05/11/94	Westboro
Jeanne Cooper-Livingston	05/11/94	Westboro
Gail Chamberland	05/11/94	Westboro
Wiliam Tkachuk	05/18/94	Ayer
Shawn O'Malley	05/25/94	Ayer
Scott Williams	05/31/94	Ayer

Promotions

None

Transfers

None

Leaves of Absence

Thomas Valley	Military Leave	07/09/93-08/11/93

Miscellaneous Transactions

Thomas Valley	Correct Step Date	08/09/93-08/11/93
Nancy Limosani	PT to Full Time HR	09/05/93
Mark Tisa	Reallocation	10/01/93
John Buckley	Reallocation	10/01/93
Robert Deblinger	Reallocation	10/01/93
Thomas French	Reallocation	10/01/93
Wayne MacCallum	Reallocation	10/03/93
Nancy Melito	Reallocation	10/03/93
Carl Prescott	Reallocation	10/03/93
Eleanor Horwitz	Reallocation	10/03/93

Terminations

Al Ortiz	Game Biologist	NorthEast	08/14/93
Jay Copeland	Conserv. Bio.	Boston	02/17/94

(Seasonals)

Jon Sojka	07/03/93	Sunderland
Michael Vivaldi	07/17/93	Westboro
Paul Sevigny	07/17/93	Westboro
John Sheppard	08/28/93	Westboro
Jeanne Cooper-Livingston	08/31/93	Westboro
Robert Bright	08/31/93	Westboro
Shawn O'Malley	08/31/93	Ayer
James Guthrie	11/05/93	Ayer
Jay Willets	11/27/93	Ayer
Scott Ewell	06/30/94	Bitzer

Financial Report

Financial Staff

Nancy Melito, *Assistant Director, Financial Affairs*
Mary Cavaliere
Priscilla Dunbar
Lillian Hew
Yunus Khalifa
Nancy Limosani
Carl Lui
Mary Lou Raples
Elizabeth Sienczyk
Ruthann Surrette
Tamara Wooster
Helen Yung

How the Sportsmen's Dollar Was Spent

July 1, 1993 to June 30, 1994

PROGRAMS/ASSESSMENTS	EXPENDITURES	PERCENTAGES
Administration:		
Administration	828,443	
Information-Education	363,480	
Total	1,191,923	12.18%
Fisheries and Wildlife Programs:		
Hatcheries	1,179,093	
Game Farm	192,081	
Cooperative Units	160,500	
Fisheries and Wildlife Management	2,871,534	
Total	4,403,208	44.98%
Other Programs:		
Construction and Development of Facilities	84,033	
Equipment	285,958	
Mass. Wildlife Magazine	83,684	
Land Acquisitions	767,875	
Waterfowl Management Program	42,925	
*Natural Heritage Program	102,806	
Hunter Safety Program	216,792	
**Environmental Law Enforcement	923,512	
Total	2,507,585	25.62%
Other Assessments:		
Retirement Fund	870,231	
Group Insurance and Other Fringe Benefits	793,517	
Medicare Chargeback	22,485	
Total	1,686,233	17.22%
TOTAL EXPENDITURES:	9,788,949	100.00%

*50% of Natural Heritage Program expenditures are charged to Inland Fish and Game Fund; 50% to the Nongame Wildlife Fund.

**15% Assessment for Environmental Law Enforcement expenditures.

Summary
Revenues, Expenditures and Fund Equity
Nongame Wildlife Fund
July 1, 1993 to June 30, 1994

REVENUES	
Nongame Wildlife Tax Checkoff Donations	300,415
Fuertes Prints Sales	511
Sales, Other	5,280
Federal Aid Reimbursements	2,791
Direct Donations	22,561
Assoc. Indirect Cost Reimbursements	6,939
TOTAL REVENUES:	338,497
EXPENDITURES	
Nongame Wildlife Program	353,845
Fringe Benefit Costs	54,376
Natural Heritage Program*	81,512
Comptroller's Adjustment	526
TOTAL EXPENDITURES:	490,259
TOTAL FUND EQUITY:	167,517

Other Funds and Programs
Expenditures
July 1, 1993 to June 30, 1994

TRUST FUNDS	
Bald Eagle Trust II	0
Bald Eagle Trust III	2,833
TOTAL EXPENDITURES:	2,833
FEDERAL GRANT	
Waterbirds Habitat Protection	13,322
Wetlands Communities Protection	13,851
	27,173
CAPITAL OUTLAY FUNDS	
Sunderland Hatchery Reconstruction	1,508
Sandwich Hatchery Reconstruction	177,419
Cold Water Streams (Assoc. Costs)	35,433
Adjacent Land Acquisitions	10,000
TOTAL EXPENDITURES:	224,360

Summary
Revenue and Fund Equity
Inland Fish and Game Fund
July 1, 1993 to June 30, 1994

DEPARTMENTAL REVENUES	
Fishing,Hunting and Trapping Licenses	3,842,228
Archery Stamps	180,922
Trap Registrations	791
Waterfowl Stamps, Administration	14,648
Waterfowl Stamps, Ducks Unlimited	17,924
Waterfowl Stamps, Other	50,946
Wildlands Stamps	1,347,383
Antlerless Deer Permits	98,811
Bear Permits	8,884
Turkey Permits	67,597
Special Licenses,Tags and Posters	18,337
Fuertes Prints Sales	127
Magazine Subscriptions	5,133
Sales,Other	73,857
Fines and Penalties	26,290
Rents	38,277
Prior Year Refunds	5,240
Miscellaneous Income	2,691
Total	5,800,086
FEDERAL AID REIMBURSEMENTS	
Dingell-Johnson (Fisheries)	605,788
Pittman-Robertson (Wildlife)	1,076,601
Endangered Species	0
Indirect Cost Reimbursements	689,285
Total	2,371,674
TAXES	
Gasoline Tax Apportionment	754,511
OTHER FINANCIAL SOURCES	
Reimbursement for Half-Price Licenses	59,814
Investment Earnings	42,719
Total	102,533
TOTAL REVENUE:	9,028,805
FUND EQUITY AS OF JUNE 30, 1994:	4,343,769

License and Stamp Sales

July 1, 1993 to June 30, 1994

Type of License/Stamp	Unit Cost	Quantity	Amount
Resident Citizen Fishing	12.50	145,917	1,823,962.50
Resident Citizen Minor Fishing	6.50	5,061	32,896.50
Resident Citizen Fishing (Age 65-69)	6.25	4,918	30,737.50
Resident Cit. Fishing (Over 70, etc.)	FREE	7,122	0.00
Resident Alien Fishing	14.50	2,159	31,305.50
Non-Res. Citizen/Alien Fishing	17.50	8,978	157,115.00
Non-Res. Citizen/Alien Fishing (7 day)	11.50	2,458	28,267.00
Duplicate Fishing	2.00	964	1,928.00
Resident Citizen Trapping	20.50	335	6,867.50
Resident Citizen Minor Trapping	8.50	10	85.00
Resident Citizen Trapping (Age 65-69)	10.25	33	338.25
Non-Res. Trapping	300.00	0	0.00
Duplicate Trapping	2.00	7	14.00
Resident Citizen Hunting	12.50	33,098	413,725.00
Resident Citizen Hunting (Age 65-69)	6.25	681	4,256.25
Resident Citizen Hunting (Paraplegics)	FREE	227	0.00
Resident Alien Hunting	19.50	673	13,123.50
Non-Res. Cit./Alien Hunting (Big Game)	48.50	2,123	102,965.50
Non-Res. Cit./Alien Hunting (Sm. Game)	23.50	1,031	24,228.50
Non-Res. Cit./Alien C.S.P. Hunting (3 day)	19.50	56	1,092.00
Duplicate Hunting	2.00	446	892.00
Resident Citizen Sporting	19.50	60,589	1,181,485.50
Resident Citizen Sporting (Age 65-69)	9.75	2,511	24,482.25
Resident Citizen Sporting (Over 70)	FREE	17,342	0.00
Duplicate Sporting	2.00	1,136	2272.00
TOTAL LICENSE SALES (GROSS):		297,875	3,882,039.25
Archery/Primitive Firearm Stamps	5.10	35,832	182,743.20
Collectors (Archery Stamps)			329.10
Collection of Shortages			25,049.31
Collection of Bad Debts			34,584.14
Fees Retained by Clerks			-86,109.25
Refunds			-15,485.75
Trap Registrations			791.00
Waterfowl Stamps	5.00	13,953	69,765.00
Collectors (Waterfowl Stamps)			16,424.00
Fees Retained by Clerks			-2,671.00
Wildlands Stamps	5.00	267,523	1,337,615.00
Collectors, Donations Wildlands Stamps			9,768.00
TOTAL LICENSE/STAMP SALES (NET):		615,183	5,454,842.00